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Management Digest®

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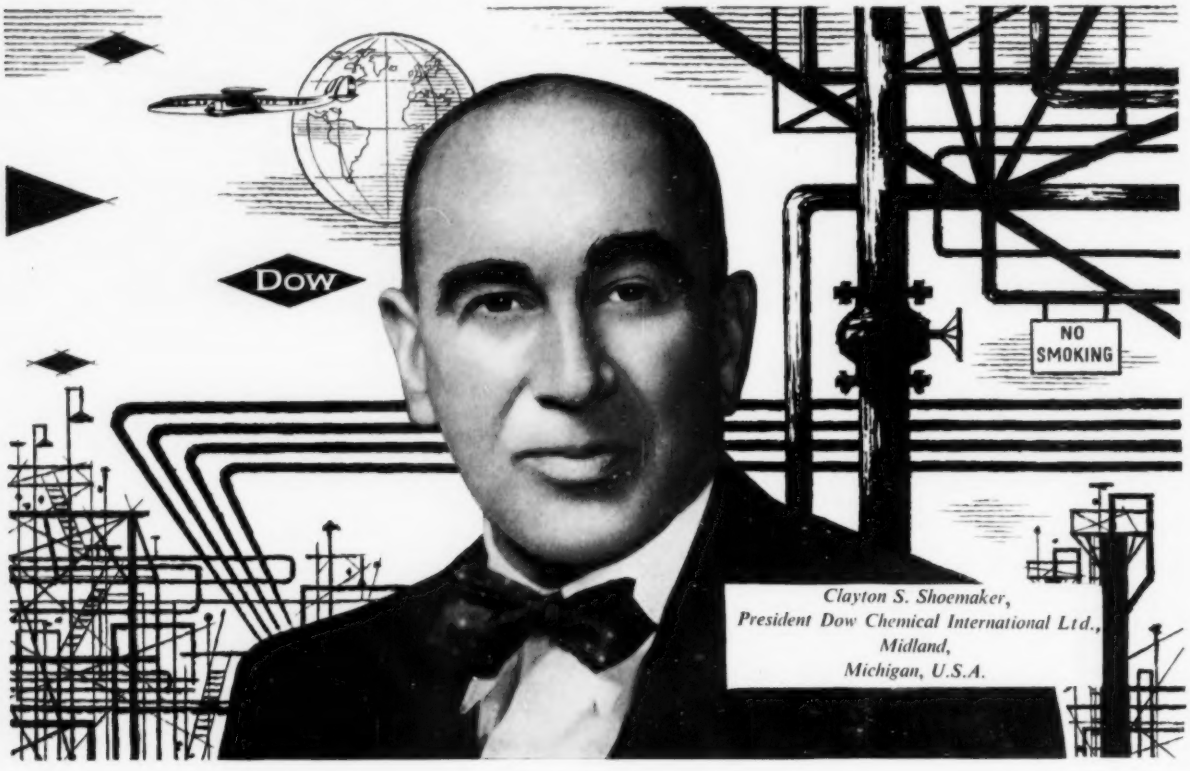

Clayton S. Shoemaker,
President Dow Chemical International Ltd.,
Midland,
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Synthesist in action...

Bushy-browed, non-smoking, witty ... Clayton S. Shoemaker, President of Dow Chemical's export branches brings to the business of trading chemicals around the world the mind of the analyst and the constructive urge of the synthesist. Commanding the world-wide operations of his companies, he does more than just figure-heading a huge staff. He is the master-mind behind Dow's global growth. His elements are people, men of many tongues. He studies their views, judges their reactions against the background of their own parlour. It's all in aid of his crusade for a closer fusion of nations, for better international understanding. For twenty years he has worked under the sign of Dow's diamond trademark. He moulded Dow's export companies after his own design, steered them through the experimental phase. Today their output surpasses double the pre-war figures of the domestic company. He likes tasty food, however exotic. The osso bucco and the smørrebrod. Their chemical formula worries him not one wit. He rarely worries. Strange for a man who has made farming one of his hobbies. But another hobby is flying. He was climbing into planes at the dawn of commercial aviation. Now there's an empire to be inspected. Currently he is averaging 50,000 miles a year. Often he is accompanied by his charming wife Opal, a licensed pilot herself. Whenever possible he flies with KLM. And that is often. For KLM's interests extend to the corners of the world too. "And there's no better formula for travelling than flying KLM", says Mr. Shoemaker.

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* To understand fully how the Chronomat operates, write to Breitling/Geneva for cardboard cut-out working model.

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Management Digest.

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NEW YORK CITY
JULY 1957

The Readers Report

Management at Work

Sir . . . I have had the pleasure of receiving the magazine Management Digest which you so ably direct, and in which you have inserted a note dealing with my industrial activities in Argentina [March, p15]. It is an honor indeed, considering the wide distribution and importance of your journal.

I have read attentively through the entire magazine and must say that it covers all the main industrial problems of Latin America in a clear, simple, and concise manner. I travel frequently to many countries on this continent and thus am in a position to appreciate your evaluation of the local industrial situation in each case.

With respect to the page "Management Men at Work," I should like to suggest that more stress be laid on the need for, and the work performed by, executives, emphasizing the close relation that exists between industrial progress and capable management, so as to give a clear-cut picture of the important role played by managing executives in the economic development of Latin American countries and, for that matter, of any country in the world.

OVIDIO GIMENEZ
MOLINOS RIO DE LA PLATA
BUENOS AIRES, ARGENTINA

Expense Accounts

Sir . . . Your article "Meet the Business Diplomats" [May, p11] makes very derisory remarks: "The Englishman, travelling with his lady on a company expense account, anxious to enjoy the Neapolitan sun and the cocktail contacts of an ICC Congress."

For your information I would inform you that H. M. Government would be very interested to learn who the lady in question was, for such charges are not admitted for tax purposes.

I would also venture to suggest that the gentleman concerned was probably a Briton, possibly Scottish, possibly Welsh, possibly Irish or possibly English, and I have no doubt that he too was as anxious to gain some value from the Congress quite as much as the German, the Japanese, or the American.

H. W. GILBERT-ROLFE,
Mng. Director
PRESTWARE LTD.
LONDON, ENGLAND

● Apologies are in order. The expense-account Englishman was merely an example, and could just have easily been a German, a Japanese, or—most likely—an American.

The Man Who Made It

Sir . . . You might perhaps be surprised to hear that the inventor and designer of the "Precision Rivetter" in the March issue [p57] has been a subscriber to the magazine for years.

In fact I was greatly amazed when I found the paragraph describing my own work, for I had never dreamed it might appear in a leading magazine like Management Digest.

To tell the truth, the Precision Rivetter has been designed and marketed to fit conditions in light industry here in Japan, but little thought had been given to overseas interest.

So you might be able to imagine my surprise. But what I was astonished at above all is the attentiveness of your news-gathering facilities which did not miss even a small machine like this rivetter in the Far East.

K. TSUJIMURA, Director
KOKI SHOKAI LTD.
TOKYO, JAPAN

Coffee Confusion

Sir . . . As an inveterate coffee drinker, and a person interested in Latin America, I could not help but feel something was slightly awry in your otherwise excellent article, "The Coffee Story" [June, p19]. I would bet that on chart #2, the labels "Supply" and "Demand" on the graphs are reversed. Either that, or there was a desperate coffee shortage in 1955-56 that I was not aware of.

GEORGE BROWNE
NEW YORK

● Mr. Browne wins his bet, and a cup of coffee (in ample supply) from the editor. Fortunately the error was discovered before the Latin American edition went on the press, so only readers of the Overseas Edition need take note.

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WORLD TRENDS

SHADOWS OVER LATIN AMERICA

Some serious business problems are at hand in Latin America.

They were discussed at the recent United Nations economic meeting at La Paz, Bolivia. And you will hear more about them at next month's important inter-American conference in Buenos Aires.

First: It is apparent now that, during 1956, per capita income in the 20 Republics failed to rise. For the first time in years, Latin American output failed to keep up with soaring population growth.

This is a worrisome trend—if it is a trend. The slowdown may be temporary, and due to a drop in farm output and anti-inflation controls in several nations. Overall, 1956 saw a healthy rise in exports and a larger trade surplus, plus a surging 60% increase in the net inflow of foreign capital.

Second: The shadow of Africa loomed menacingly over La Paz. Africa's growing prominence in world affairs, and its special position in the projected European Common Market, worried many. Already, Europe's imports of African foodstuffs and raw materials are rising sharply. Even the U. S. A. is buying much more African coffee.

The prospect of the sleeping African giant suddenly emerging as a powerful, competitive raw material producer frightens many Latin Americans. Yet keep these facts in mind: It will be decades before Africa can offer the markets and the industrial investment opportunities that abound in Latin America. Further, Europeans will be loath to cut back their purchases from Latin America for fear of losing markets there.

Nonetheless, the economic situation and the winds from Africa will accelerate (1) Latin America's drive for industrial self sufficiency, and (2) the plans for stimulating inter-Latin American trade. Progress on trade will be slow and fitful, but the La Paz meeting showed that Latin Americans are moving more resolutely toward regional payments arrangements, and possibly toward "common markets" for some industrial products.

THE FOUR-DAY WEEK?

Mr. Walter Reuther, leader of the American autoworkers, has opened the campaign for the "four-day week." He told the auto industry that his union will demand a shorter week, and more pay, next year.

The four-day week is not imminent. But all the talk is clearly the shadow of things to come. And this worries many businessmen and investors, who fear labor's demands may some day wreck the economy.

Here is how one business analyst assesses these fears:

"The labor people are about the only ones who would deny that the possibility exists. But even the most anti-union economist must admit that the drive for higher pay and shorter hours has been one of the most powerful factors contributing to our high level of postwar activity."

Labor demands, the analyst continues, have, firstly, intensified the drive for more efficient plant and equipment to cut costs. This has stimulated the capital goods industries, and greatly increased labor productivity.

Turn the page for more WORLD TRENDS

Secondly, labor demands have been a big factor in lifting (and broadly distributing) "discretionary income"—creating a mass market for goods and services other than basic necessities.

Of course, if the unions limited wage demands to an amount equal to the gain in productivity, the U. S. A. would enjoy both higher incomes and a stable price level. But, in most postwar years, hourly wage rates have gone ahead faster than output per man-hour—and prices move upward.

Now a new phenomenon enters the U. S. outlook. In manufacturing, new equipment and techniques help keep output fairly close behind wages. But today, the largest percentage of American workers—over one-third—are employed in service jobs. And major productivity advances in service industries are difficult.

The implication of all this: U. S. prices are likely to feel more upward pressure from costs of services than from rising goods prices. And of all industries, service and other "office" groups will be searching hardest for ways to reduce costs—with new techniques and new machinery.

120,000 A DAY

The past decade has seen a "phenomenal decline" in mortality, reports the United Nations. As a result, the world's birth rate—at 34 per 1,000 persons per year—is rapidly pulling away from a death rate of 18 per 1,000. The difference adds 120,000 people a day, 43-million each year.

Better sanitation, more efficient drugs, cleaner water supplies, improved diet—all these are having a tremendous impact on mortality. Within 50 years, the present world population of 2,700 million is likely to double.

As mortality decreases, life expectancy will rise—and the rise will be greatest where life is shortest. Today the average Dutch child can look forward to 71 years of life, the Indian only 32. The future promises many more productive years for people in many countries. That promise creates great opportunities—plus great problems and responsibilities—for businessmen and governments everywhere.

MATERIALS—OLD AND NEW

Japan, Britain, and the European Coal and Steel Community are in a battle for a familiar but vital commodity—U. S. steel scrap. At the end of March they had pushed U. S. scrap exports 34% above first quarter, 1956. Then, pressure from American steelmakers (who fear a long-range shortage) caused the Dept. of Commerce to temporarily halt scrap exports.

Now it looks like the ban is at least being partially lifted. U. S. scrap dealers claim it is unwarranted. Scrap prices are rising, but dealers insist there is a glut of exportable scrap of little or no use domestically. And the State Dept. wants to be sure steel mills abroad get the scrap they need to keep producing.

The result is compromise: Japan, whose need is largest, will be allowed more scrap than last year; other buyers will get more too. But no one will get as much as he would like.

Science may have hurdled the "thermal barrier" with a new family of glass materials.

Called "Pyroceram" and developed by Corning Glass Works (U. S. A.), these glass compounds will not lose strength at 700°C. They can be made harder than steel, nine times as strong as plate glass, and lighter than aluminum. Potential end uses range from jet-engine turbine blades and rocket nose cones to home cooking utensils.

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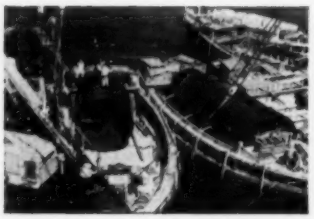

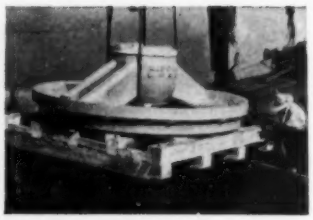

Allis-Chalmers machinery for a new cement plant goes ashore at the island of Taiwan.

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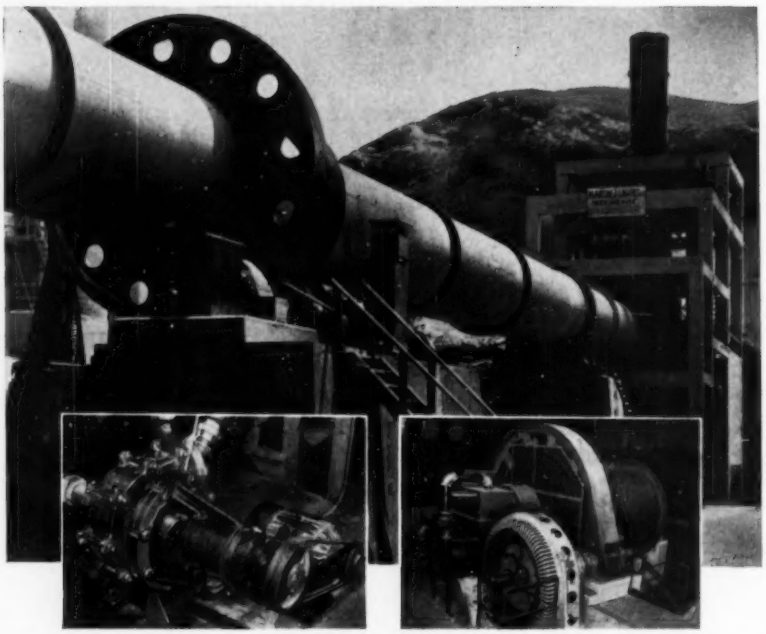

KILNS. Large photo shows a 9'6" x 300' Allis-Chalmers rotary kiln installed in a cement plant in Lima, Peru. A-C kilns provide high production and economical operation.

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More Business for the "Tax Havens"

More business means higher taxes—unless world traders are set up in low tax areas. And that is just what they are doing.

As the tempo of world trade and investment increases, more businessmen earn more income from international transactions. More income generally means larger taxes. And that prospect spurs management men to new efforts to reduce the tax burden on their profits.

One way to cut taxes on international business is using a "tax haven"—a country or territory that grants preferential tax treatment to income earned outside that country. This year, more and more businessmen are organizing, in such tax sanctuaries, corporations to handle their overseas business. And some of the tax havens themselves are actually competing for new corporations from abroad.

Everywhere, there is greater concern with the tax aspects of international business:

—More U. S. companies are using tax havens. They hope to accumulate foreign earnings free of heavy U. S. taxes, for reinvestment abroad or for eventual return to the U. S. A. This development is an important source of business activity to several countries.

—Europeans, Japanese, others seem to be establishing more "base companies" abroad for third-country operations.

—Organizations designed to serve these base companies are appearing. Overseas Management Co. of Panama is building a good business acting as agent for companies using the device of a Panama corporation. International Trust Co. of Liberia has a correspondent organization in New York, and a brand new one in Zurich, to sell Liberia's tax benefits.

—Other areas have been revising their laws to attract foreign corporations. The Dutch Antilles and the Bahamas have enacted special legislation in the past four years; Honduras has proclaimed itself a tax haven. In Mexico, businessmen are studying the law to see if certain base company operations are possible there.

—The British government has proposed, in its new budget, certain tax exemptions for resident companies doing business wholly overseas. There is pressure on the U. S. government to revise its own tax laws—which now tend to encourage American firms to use overseas tax havens.

—More international tax studies are appearing. In the U. S. A., the Harvard Law School—working with the United Nations—has begun publishing comprehensive studies of other nations' taxes. (Volumes on Brazil, Mexico, and the United Kingdom are now available.) The British government has expanded its tax analyses of important trading nations. And the Dresdner Bank has begun a series of foreign tax studies for German businessmen.

The most visible inhabitants of tax havens are ship operators, who long ago recognized the advantages of Panamanian, and later, Liberian, registry. Beyond that, it is difficult to generalize.

For example, a Japanese merchant may sell goods to his Panama corporation at the lowest possible price, package them in Panama, and have the Panama company resell to the U. S. A. at the highest possible price. A German machinery maker may have a plant in Brazil, and accumulate earnings free of German taxes in a Liberian "base company." A European family group might direct investment earnings into a Uruguayan, Luxembourg, or Liechtenstein holding company. Through a Venezuelan corporation, an American could pile up tax-free earnings from sales outside that nation, and at the same time serve the booming Venezuelan market and pay taxes only on earnings there.

Foreign corporate bases are, in most cases, legal "tax avoidance" (as opposed to illegal "tax evasion"). But there are many dangers in even the most "legal" setup; anyone contemplating tax haven operation needs a lawyer well-versed in his own, as well as foreign, tax law. And because of secrecy and loose corporation laws in some tax havens, plenty of illegal operations exist.

It is difficult, too, to generalize about the tax havens themselves. In an authoritative new study called *Tax Factors in Basing International Business Abroad* ($5.00; Law School of Harvard University, Cambridge 38, Mass., U. S. A.) experts at Harvard's International Program in Taxation point out that more than 40 nations and territories give preferential tax treatment to foreign income. But the authors remind their readers (and the book is designed primarily to relate U. S. tax law to foreign operations) that many of the 40 are not useful to most international businessmen. Exchange controls, limited tax benefits, vagueness of tax laws, inaccessibility—all these must be weighed.

On the following pages, MANAGEMENT DIGEST compares 12 tax havens or base countries, adapting the much more extensive and detailed analysis of them that appears in Harvard's *Tax Factors*. One famed corporate base, Tangier, is left out—not because it is not a useful base for international business, but because Tangier's new status as an integral part of Morocco may mean changes in the tax laws.

TAX HAVENS	GENERAL	TAX SYSTEM
BAHAMAS	Self-governing British colony, useful for non-British base co. But exchange control (save for a few trading firms); local opposition to non-residents competing in local business.	No income, capital gains, dividend withholding taxes. Only recurring taxes on base cos. are stamp taxes, plus tax on improved Bahamian real estate. Also small probate duty.
BERMUDA	Another British colony useful to some base cos. Bermuda investigates schemes to assure legality, protect itself from competition. Exchange control—with exemptions.	No income, capital gains, dividend, estate taxes. But all foreign-owned cos. doing business abroad pay flat tax of $560 yearly, plus small stamp taxes on security transfer.
CANADA	Authorities take negative view of base cos., investigate them carefully. Exemptions are exceptions to the law, and are subject to changed interpretation or even outright repeal.	Income tax patterned on U. S. and British systems, with rates comparable to U.S.A. Other detailed, complex taxes—on dividend withholding, distributed capital gains, etc.
HAITI	Encourages direct investment, offers tax benefits. While few cos. deriving income wholly outside nation organized, Haiti is a potential base because foreign income is tax exempt.	Income taxes on business profits, personal income, earned in nation. Dividend withholding tax, capital tax on shares, small license fees for all business, foreign and Haitian.
LIBERIA	Laws designed to make nation attractive domicile for foreign business—many U. S., European cos. set up. U. S. dollar is currency; no exchange control; easy incorporation.	Taxes on net income from Liberian operations; no taxes on income earned outside Liberia by foreign cos. No estate taxes. Small stamp taxes, and tax on shipping tonnage.
LIECHTENSTEIN	Tiny principality well-known in Europe as corporate domicile. Much of its revenues comes from foreign cos. Preferential tax treatment to all doing business outside nation.	Liechtenstein income and capital taxes, and Swiss dividend taxes may apply. But foreign-owned base cos. doing business wholly abroad usually pay only a small annual capital tax.
LUXEMBOURG	Another old-time base for many European holding cos., often family-owned. Cos., and individuals, in active manufacturing or trade face complex tax system and relatively high rates.	Same treatment for foreign and domestic income. Active businesses pay income, capital, dividend taxes. Even non-resident directors, managers, auditors pay taxes on salaries.
NETHERLANDS ANTILLES	These Caribbean islands recently began to invite base cos.; more than 200 set up now. Free zone available at Curacao for traders to handle goods; exchange control—with exemptions.	Personal income tax, profits tax—but no dividend, royalty, capital taxes. Base cos. are exempt from taxes on nine-tenths of income—and the effective tax rate is just about 2.4%.
PANAMA	Laws tailored to foreign cos. doing business outside nation. Thousands of cos. (many ship lines) set up; special management services available to help. Also free zone for traders.	Income tax on individuals and cos.—but income derived abroad exempt. Tax test: If income-producing goods never physically enter Panama, income exempt. Also stamp taxes.
SWITZERLAND	Since nation is confederation of 25 cantons, and all can levy taxes as well as federal government, tax liability varies widely. But holding cos. especially can benefit from laws.	Tax liability based on residence—so all income, foreign and domestic, of Swiss co. is taxable. Federal government collects income and capital taxes, cantons collect more.
URUGUAY	For many years Uruguay has been a base for investment in Brazil, Chile, Argentina. Fewer companies established since 1950 because of new restrictions on foreign holding cos.	No general corporate or personal income tax; but excess profits tax and special income tax on Uruguayan income. Base cos. often need pay only small capital tax of .3% of assets.
VENEZUELA	Prosperity and fact that foreign income is tax exempt makes for good base country. Also you can do business in Venezuela and not lose tax exemption on foreign income.	Basic tax and surtax on various classes of income earned in Venezuela. Inheritance, license, stamp, and capital gains taxes. But all dividends specifically tax exempt.

ALLOWABLE BASE COMPANIES	INCORPORATION LAWS
Bahamian holding or investment firms owning securities, or receiving royalties from non-sterling-area corporations; and trading companies organized in Grand Bahama "Freeport," operating outside Bahamas, earning income outside sterling area.	Wide variety of corporate forms, no restriction on nationality of officers, kinds of stock, place of meetings. Base cos. must have registered office, keep records there. Incorporation may take 2 weeks, cost (including lawyer) averages $600.
Advantages for (1) Bermudian holding or investment firms owning securities in, or receiving royalties from, non-sterling area corporations; (2) Bermudian trading cos. deriving income from operations abroad, earned outside sterling area.	More restrictive than Bahamas—incorporation is by legislative act, can take several months. Cos. must maintain registered office and records in islands, with local directors. Requirement that 60% of stock be owned by British subjects sometimes waived.
Some tax advantage for (1) cos. incorporated in Canada and managed abroad; (2) for cos. receiving dividends from non-residents; (3) non-resident investment cos. (95% owned by non-residents); (4) cos. doing business wholly outside Canada.	Incorporation either under federal or provincial acts; detailed requirements as to meetings, shares, officers, records kept by agents. Incorporation takes a month, costs from $600 to $1,000. No requirement of minimum paid-in capital.
Any Haitian holding, investment, or trading company carrying on all business outside nation, managed abroad, with no income physically entering Haiti, may benefit from tax laws. Tax test is apparently on basis of where income is "realized".	No limitations on meeting places, foreign ownership or management; one director must be Haitian. Co. must file annually copy of balance sheet (with $20 stamp tax). Incorporation depends on Presidential decree, may take three months.
(1) Liberian holding or investment co. receiving dividends or royalties from foreign corp.; (2) trading co. deriving income from operations outside nation; (3) co. operating Liberian-registry ships that are not engaged in Liberian coastal trade.	Base co. must have agent in Liberia, but wide flexibility on stock issues, no periodic reports or meeting limitations. International Trust Co. (with correspondents in U. S. and Europe) can set up co. in 48 hours, act as agent for a year, for $500.
Tax advantages for (1) co. with operations both in Liechtenstein and abroad; (2) holding or investment cos.; (3) co. merely domiciled in Liechtenstein but carrying on all activities abroad. Each base co. type subject to different tax liability.	Probably most flexible corporation laws in the world; co. can incorporate under any laws. Resident agent, records required; minimum capital must be paid in ($2400 to $6000). No residence or nationality restrictions. Incorporation may take two weeks.
Luxembourg holding cos., owning and managing shares in other enterprises, and with no business activity, can enjoy tax advantages. Those under 1,000-million francs pay no income taxes, larger ones do. Also salary and subscription taxes.	Corporation must have three directors, and auditors who must hold meetings in Luxembourg. Records must be filed, a legal reserve built up from net profits. Taxes, other costs of incorporation of $100,000 firm might be $1300 to $1800.
To take advantage of laws: (1) any Netherlands Antilles holding or investment co. whose income derives from securities issued abroad; (2) any trading co. deriving income from an enterprise outside islands that pays a foreign income tax.	No restriction on nationality or residence of officers, owners, directors; shareholders meeting must be held in islands. Incorporation must be approved by Governor, who investigates carefully. Four weeks required; there is an annual listing fee.
These cos. can take advantage of laws: (1) Panama holding or investment co. receiving income from abroad; (2) trading co. earning money from outside; (3) shipping co. deriving income from Panama-registered vessels engaged in world commerce.	Extremely liberal corporate laws, few restrictions on activities, meetings, ownership; almost any kind of corporate charter will do. Articles of incorporation can be executed anywhere; registry tax, other fees, bring incorporation charges to $1500.
Only holding cos. get favorable tax treatment under both Federal and cantonal laws, and often pay only small capital taxes. Domiciliary cos.—doing no business in a canton—pay full Federal, but get cantonal relief. No cos. completely exempt.	Majority of directors must be resident Swiss nationals (with a few exceptions); all directors must be shareholders. Minimum capital: 50,000 Swiss francs, 20% paid in before first meeting. Incorporation costly—because of a high stamp tax on stock.
Foreign Holding Co. Law is key factor. Holding company must have investment as principal activity, and invest 51% of capital abroad and receive more than 50% of income from abroad. Activities of holding cos. hedged with restrictions.	Great administrative flexibility in incorporation. Two persons must set up co., shareholders must meet in Uruguay yearly, with one director or general agent resident in nation. Cost of incorporation runs from $800 to $1125, including lawyers.
Any Venezuelan co. receiving income from sales, dividends, interest, royalties, contracts executed outside nation enjoys tax benefit. Tax tests: Where title to goods passes, and where real center of taxpayer's business operations is located.	No minimum capital requirements, few restrictions on shares, nationalities, meetings. Co. must put 5% of profits into reserve until fund amounts to 10% of capital. Incorporation takes two weeks, costs $365—plus lawyers and .1% registry tax.

SOURCE: Tax Factors in Basing International Business Abroad, Law School at Harvard University, Cambridge, 1957.

Advancing technology is creating a new kind of society in the U.S.A., with vast new demands for educated people. It is a challenge all the world must face, and it is called . . .

The Shortage of Brainpower

Digested from BUSINESS WEEK, Special Report, Apr27

The shortage of human brainpower is taking its place alongside "death and taxes" as one of the basic conditions business management is going to have to deal with for years to come.

The shortage will be long-lived because it is closely tied to the advanced stage of development reached by the American industrial society. Other nations, other societies, are meeting—or will meet—much the same challenge.

What is behind the brainpower shortage is something that tends to be obscured by all the talk of "mechanical brains" and automation. The fact is that as industrial society depends more and more on machines, it is actually putting a greater premium on the creative intelligence lacking in machines.

Recent emphasis on automation has revived the old fears—that technology is going to stifle human values. Yet, as so frequently in the past—when the industrial system was charged with demoralizing people in "factory towns"—the anxieties aroused by the system conceal its accomplishments.

Technological development affects people in two different ways:

—It puts a high premium on educated intelligence. Instead of imposing intellectual conformity, it calls urgently for men who can think for themselves.

—By increasing production faster than population growth, it solves the problem of satisfying man's physical needs. This brings greater potential for the extension of human talents.

This double effect of the modern industrial system is not some vague future possibility. It has already struck the American society with a force that few comprehend. And it cannot be checked.

I. Where is the Need?

Few businessmen realize the totality of the need for educated talent. Each area of society feels it acutely—business and industry, government, the armed forces, schools, colleges.

One symptom of the overall need is the cacophony of charges that skilled engineers are "wasting their time" on technicians' jobs, that highly-trained people are being "drained away" from one job to another. Many assume this is simply a passing phenomenon of the boom.

Actually, the talent shortage is founded on a more durable base. The demand for educated people—far from contracting when extreme wartime needs tapered off—continued to grow, through prosperity and three moderate postwar recessions.

Nobody knows this better than businessmen. *Business Week* asked over 100 corporations how many more trained people (with college education or equivalent) they needed now compared to 10 years ago. One said 20 times as many, another five times as many, others reported their needs up anywhere from 100% to 500%. And virtually every one of the companies expects the situation to become worse.

II. Upgrading the Workforce

A massive upgrading of the skills required of the entire U.S. labor force is underway.

You start with people who create new ideas, the scientists. Then you need people to engineer these ideas into things or processes. The next step calls for people who can assemble, organize, and direct the men and the money and the equipment to get the engineered ideas into production. At each step, scarcity shows up.

Then you need workers. The kind that can design or make or repair machines are in strong demand. But the ones that just work along with machines, or do the work that machines can take over, are not. Then, once goods are produced, they have to be marketed—and sales personnel are in short supply too. Finally—perhaps most scarce—are the people who have to train the others.

The reason for all of this is that the flow of new ideas has been fast and furious. They are ideas that do "make obsolete" the human types who, in their functions, resemble machines. But they put tremendous demands upon those who are capable of thinking.

Already, you see the signs of striking changes in the composition of the U.S. workforce. This year brought a historic turning-point: The "white-collar" groups —managers, professionals, clerical, sales and engineering personnel—became the biggest single segment of the labor force, outnumbering the "blue collars" bench workers, laboratory, etc.—for the first time.

III. Supplying the Brains

For the immediate future, the outlook for an increasing supply of brainpower is not too hopeful. On one hand, the lower birth rate of the 1930s is checking the expansion of the labor force in the most productive age groups. On the other hand, there is a huge crop of postwar babies which is just now beginning to strain U. S. educational facilities.

This oncoming tide of youth will put a terrific demand on the specialized talent that must be "plowed back" into educating the new generation; and it may force a deterioration in educational standards.

There's a growing debate on how to provide this flood of students with the upgraded education the nation requires. Some experts would seek ways to rapidly increase the productivity of each teacher—perhaps with educational television. Others fear that such "mass media" would only further debase teaching standards.

Some want a larger and larger

number of colleges and universities, and insist that the best teachers (and students) be spread more evenly across the nation. Others contend that the teachers and students who come to the best institutions are doing the smart thing. This makes for quality, and quality is the most important need.

There are cries for huge federal spending for schools and teachers, special schools for the brightest youths, and so on.

All Americans realize that it takes a long time to build an educational system that can turn out a large supply of trained specialists. Fewer realize, however, that any real solution to the brainpower shortage will require a certain shift in social values—a shift that will attach the highest prestige, not to speak of higher financial rewards, to the trained specialist.

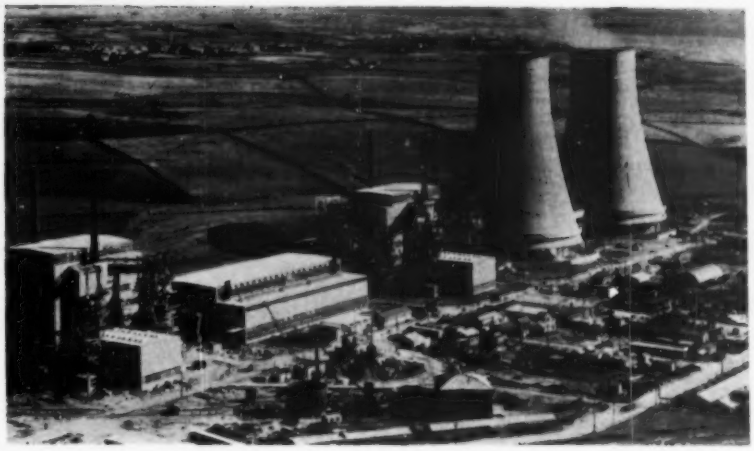
Actually, there are today signs that some cultural shift to a greater respect for educated talent is at hand. Slowly, it appears, the anti-intellectual prejudices hanging over from America's hard-bitten frontier days may be giving way before the forces of necessity.

In every past society, sheer physical need has required that a large proportion of the people be reserved for use as beasts of burden, as machines, as "attachments" to machines. Even now, much of the world struggles against this.

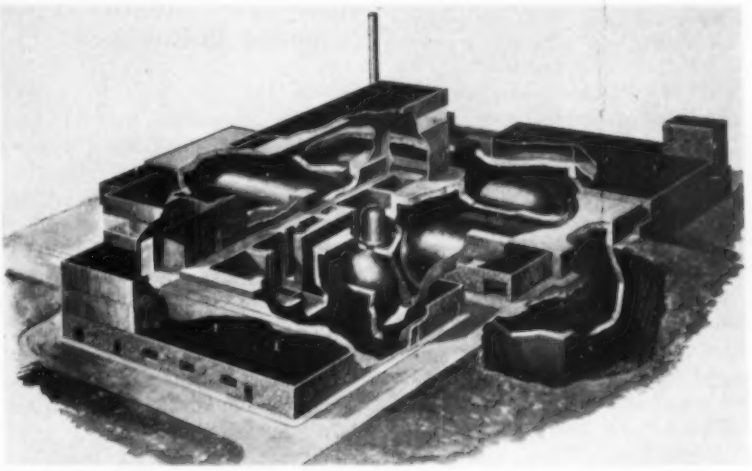
Yet today, the U.S.A. is becoming a society that is forced to treat all of its members as, in the fullest sense, thinking, imagining human beings. All barriers to the supply of educated talent—economic barriers, racial and other prejudices—must topple. Everyone, literally everyone, is invited to share the freedom and challenge which in the past a small elite group has claimed.

Everywhere, you hear enlightened leaders—many businessmen among them—stressing the importance of providing educated people with freedom to think and to question, to take responsibility and form independent judgment—and of the importance of providing individual recognition.

It should be an exciting thing to see how the mass of the U.S. population responds to this challenge in coming decades. For the challenge lies before all of civilization. ●



Britain's Calder Hall, already operating, competes with . . .



. . . U.S.-designed atom plant as the world studies the . . .

Rivals in Nuclear Power Race

Digested from CHEMICAL WEEK, May 25, p58

Though it will not produce its first power until later this year, the U.S.A.'s Shippingport atomic power plant has for several years been "in competition" with Britain's Calder Hall reactor, operating since late 1956. Now, news from Europe suggests that the competition will become keener. The latest plans call for the use of the British design for half the 15-million kilowatts that Europe hopes to build by 1967, and the U.S. plant for the remainder.

Elsewhere in the world—in Japan, and Latin America especially—the two designs are receiving a searching appraisal.

To provide a comparison of the two systems, the U.S.A.'s Atomic Energy Commission commissioned an independent survey of the merits of each. The first of the studies—comparing power costs of hypothetical, 90,000-kw. plants—was recently published. (Existing plants do not provide valid comparisons. Calder Hall is operated not only for power, but also for plutonium production; Shippingport is to be primarily experimental.)

The study indicates that in the U.S.A., the natural-uranium, gas-cooled Calder Hall type could provide power for 17.9 mills (a mill

is one-tenth of a cent) per kilowatt hour, versus 19.6 mills/kwh. for the enriched-fuel, pressurized-water U.S. design (PWR). Because of lower construction and capital costs in Britain, the breakdown there would be 8 mills for Calder Hall, 13.1 mills for PWR.

Looking ahead to later versions of the two, there appears to be less difference in cost. Projected power costs of large-size plants—such as those being considered by the Europeans—are about the same. The cost attainable by 1967 might be 11-14 mills/kwh.

From the standpoint of potential cost reduction, the PWR may be in a more favorable position than the British plant. The recent U.S. study reports that heat fluxes of two to three times the design value may be ultimately possible in PWR. But Calder Hall may be closer to its upper heat limits.

Either way, nuclear power, even at 11-14 mills, seems competitive on paper with the 10 mill power generated by Europe's dwindling coal and precarious oil supplies. But financing and building that capacity is something else again.

Early in May, a committee of the six nations that have signed the Euraton nuclear energy treaty urged the Continent to work for a nuclear capacity of 15-million kw. by 1967—at a cost of $6,000-million. That would be about $4,000-million more than the cost of conventional power. In the beginning, 50% of the equipment would have to come from the U.S.A. and Britain; total foreign exchange costs of the equipment would be $1,100-million; nuclear fuel would add $1,000-million.

Most observers do not consider that goal completely out of reach—provided the Six work together, and provided they receive help.

According to U.S. government sources, it is almost certain that much of the reactor equipment needed from the U.S.A. will be financed by the Export-Import Bank (MD, Feb, p 12). Also the Atomic Energy Commission is mulling over several proposals to help Europe and other areas with development aid and fuel supplies. Finally, American industry—facing delays in nuclear power development at home—is willing and eager to play a role overseas. ●

IBEC Seeks New Worlds

Nelson Rockefeller's Latin American development firm had its troubles, but now plans new activities—and expansion to Europe.

For 10 years, the International Basic Economy Corp. (IBEC), created by Nelson Rockefeller and his brothers, has been trying to combine a vision with practical business in Latin America. The decade has been a difficult one. Sometimes the vision of helping Latin America raise its living standards has been thwarted by tradition, sometimes by unprofitable investment, and sometimes by plain poor management.

And through all its troubles, IBEC has been misunderstood—confused in the public mind with Rockefeller philanthropy—and its identity as a serious business undertaking has been blurred.

But note the signs of change. IBEC's first public annual report shows that the company is now making a profit. And further, there are plans for new activities:

—**In Brazil,** an IBEC subsidiary is already selling shares in a mutual investment fund.

—**In Italy,** IBEC has a project to open a chain of "supermarkets," in partnership with Italians.

—**In West Germany and Canada,** IBEC plans to market "instant" (soluble) coffee.

—**In Iraq,** IBEC may join with a government housing project.

—**In New York,** just as MANAGEMENT DIGEST went to press, Nelson Rockefeller took IBEC into export finance. IBEC, he announced, is buying a controlling interest in American Overseas Finance Corp., a private export credit company set up two years ago by five U.S. banks. AOFC activities will expand beyond the financing of U.S. capital goods exports, Rockefeller declared. There may be a wide variety of international lending operations, and possibly equity investment in businesses overseas.

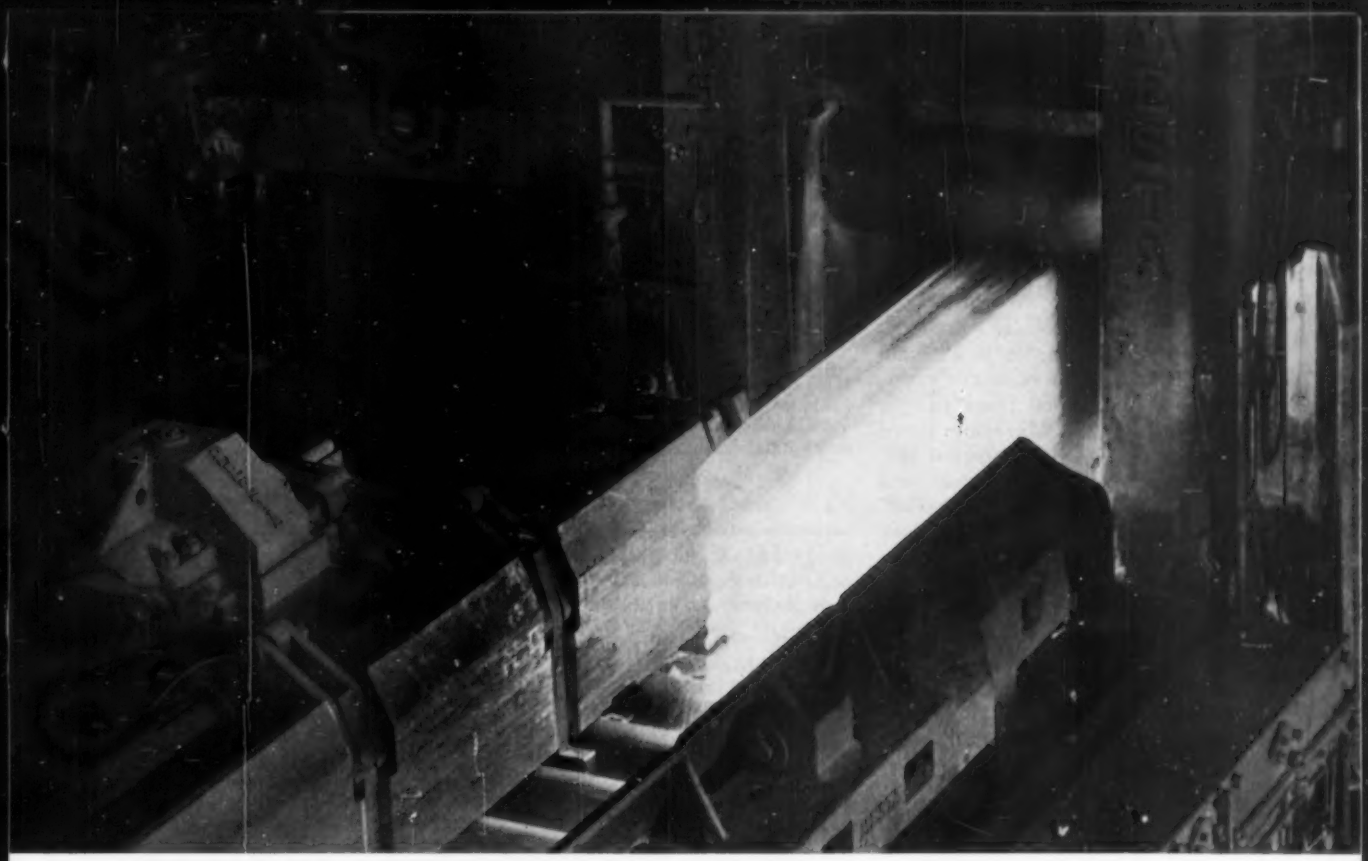
IBEC was conceived in 1947 with the twin goals of (1) promoting economic development and (2) profiting—in association with others—in Latin America.

At first, IBEC decided to attack food production, and put a lot of money into sending mechanized farming techniques to Venezuela as a test area. The theory was sound; but in practice it did not work. Next, IBEC decided to try food wholesaling. That failed too. Finally, IBEC settled upon retailing—via the supermarket. Today, IBEC supermarkets are operating profitably in Puerto Rico and Venezuela, and Nelson Rockefeller believes that they have helped lower retail food price indexes by as much as 15% in both areas. Now, local companies are setting up supermarkets.

Rockefeller has been particularly interested in developing local capital markets. Yet the first venture, an investment underwriting house in Brazil, took heavy losses. Now the Brazilian mutual fund idea seems more solidly based. And Rockefeller sees the fund as a means of raising local capital for new enterprises. He hopes to arrange new partnerships, having a U.S. company join the IBEC and local investors.

Chiefly through joint ventures, IBEC today runs supermarkets in Puerto Rico, Venezuela, and Peru; builds low-cost housing in Puerto Rico; pasteurizes milk in Venezuela; grows hybrid seed corn, sells mutual funds, acts as a management consultant in Brazil, produces instant coffee in El Salvador; makes equipment for extracting vegetable oil and has an oil company in the U.S.A. ●

Digested from Business Week, Apr 27, p122



General Electric puts the muscle...

IN THE GIANT'S SQUEEZE

G-E System-engineered electrical systems assure economical power for increased steel production.

Glowing steel on its way to build our industrial world needs a lot of pinching and prodding from giant mills. In plant after plant it's General Electric equipment that gives these giants the squeeze that gets a product out faster, yet more exactly to a customer's fancy.

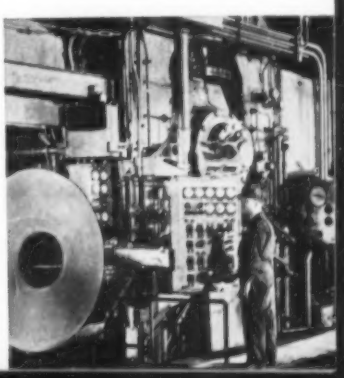
Some like it hot. The 60-inch hot strip mill at McLouth Steel Corporation utilizes individual G-E motors for each roll of roughing mill front and rear tables, as well as roughing and finishing mill approach tables. Pumpless rectifiers in unit substation arrangement are employed to supply power to individual finishing-stand motors. The results are greatly increased flexibility and ease of maintenance.

Some like it cold. Another company—Weirton Steel—brings to the job the 28,000 hp of its G-E drive system in the world's most powerful cold strip mill. Low inertia d-c motors assure fast acceleration, balanced speed for the operation. With the new automatic General Electric X-ray gage control system, this means a product of highest quality steel, with closer tolerances, at higher rolling speeds.

General Electric engineers are helping design, modernize and expand steel facilities everywhere. From blooming mill to crane control, G-E equipment speeds product flow, cuts processing costs for growing industry. General Electric's facilities are available to you. Just consult your G-E representative. *International General Electric Company, Dept. 57-37, 150 East 42nd Street, New York, N. Y., U. S. A.*

GENERAL ELECTRIC

—U.S.A.—



How to Avoid New Product

Marketing new products is full of innocent traps for unwary managers. But the traps can be avoided

A "booby trap," World War II soldiers were carefully warned, is a deadly device hiding in an innocent setting. In an economic sense, new product booby traps can be just as deadly as a grenade wired to a door knob. An estimated 80% to 98% of new product ideas succumb once they reach the market.

The seven most common dangers in marketing new products are charted at the right, along with suggestions on how to avoid them. These deadly attitudes are not always expressed exactly like the quotations, but the traps will be recognized by all marketing men.

There are, of course, other dangers. Past experience is less useful in introducing a new product than in marketing a redesigned product with an established reputation. And the most elementary pitfall of all is to neglect available information on the potential market for the new product—from trade associations, potential users, government reports, or your own market researching.

Several booby traps should be avoided before the chart is used. There must be management concern with new products to begin with. Then comes the question, "What kind of new products?" Someone must keep an eye out for ideas; the ideas must be screened and developed—by technical, sales, financial and top management personnel. The selection of management men to do this work is the most difficult task—and the most critical.

Finally, a new product must be tentatively selected for marketing.

At this point, the chart on the right can be of real value. The chart is simplified for over-all planning; the details must be drawn up to fit the particular problem. As with all management tools, the checklist must be adapted to the individual company situation.●

Trap	Minimum Steps
1. "Everybody-thinks-like-we-do" — assuming that prospective buyers, especially of a different occupational or social class, will see the product or proposition the same way, and will like its features as much, as do the people who have a special interest in it (and their friends and employees).	A. Classify good prospects, based on current information. Classify kinds of persons who responded to preliminary announcements. B. Interview some of them. Present the product or proposition as realistically as possible (picture better than description, model better than picture, sample better than model, etc.). Note questions, objections, suggestions.
2. "At - last - we - have - an - adequate design."—Stopping research and development as soon as the design or formula appears to do the job for which it was intended; failing to anticipate various field conditions; failing to take advantage of first choice of designs, sizes, colors, names, etc.	A. Let prospects use samples under various conditions. Observe performance and limitations of product; reactions, objections and suggestions of users; degree of interest. Note additional uses, new sales points, demonstration ideas. Get testimonials. B. Look at product as if competitor had introduced it.
3. "All-of-them-will-buy-one." — failing to recognize that the effective potential in each market class is limited to prospects who meet **all** these (and other) requirements—have enough need for the product, don't already have something adequate, like the product well enough to pay the price, can afford it, have a place for it.	A. Refine the definition of best classes of prospects from information already obtained. B. Interview a number of each class and obtain indication as to what proportion will buy.
4. "Selling-it-is-somebody-else's-job." — neglecting or understimating the educational and selling job necessary, and the selection of the most effective channel of distribution.	A. List the main information which must be conveyed to ultimate prospects. B. Interview some of each kind of middleman in the channels considered. Learn margins desired. C. Estimate amount of necessary initial missionary and sales training effort by company salesmen and executives. Plan number and kind of regular salesmen needed. Estimate costs.
5. "The-Lord-will-provide" — proceeding without complete budget estimates.	A. Prepare and maintain budget based on best current estimates of unit sales, selling price, selling costs including executive time, production costs and overhead. What is effect of production of this product on cost of other products? B. Total the estimated investment (including machinery, materials, inventory, losses. Is this capital available?
6. "Stay-away-from-legal-matters" — not preparing to conform to legal requirements, avoid liabilities or protect rights.	A. Have legal counsel select and check more significant legal considerations.
7. "Ship-them-and-forget-them." — failing to take full advantage of actual marketing experience to improve the program.	A. After general introduction, select successful and unsuccessful areas, salesmen and dealers; compare methods used, note differences.

Digested from PRINTERS' INK, May 3, p34

"Booby Traps"

Additional Steps

A. Expose product to groups containing probable prospects (via exhibits, magazine advertisements or announcements, direct mail, survey); learn characteristics of persons who respond. Define precisely what the product does.

B. Interview adequate samples of each prospect class. Obtain additional classification information (age, income, industry, size, location, etc.).

A. Place more samples, under more kinds of conditions. Observe usage more closely; make time-and-motion and detailed cost studies.

B. Retain independent designer and process engineer to analyze as a competitor. Have independent marketing consultant view product as a competitor.

A. From time and cost studies, calculate size above which purchase results in savings.

B. Make tests on several prices.

A. Prepare first draft of manual for selling to ultimate prospects (covering best kinds of prospects, who to see, qualifying prospects, etc.).

B. List all possible channels handling similar products or products which require similar sales effort, or which reach the same kinds of prospects. Obtain operating ratio for all middlemen.

C. Determine introductory and regular sales cost for comparable products.

A. Construct budgets based on favorable and unfavorable assumptions, and for several time periods. Break items into further detail and check against relevant experience.

B. What is the estimated return on investment? Is this better than alternate investments?

A. Have legal counsel make detailed check of all legal considerations.

A. Compare sales with suitable market index. Observe and interview employees of successful and unsuccessful dealers, compare methods and conditions.

▶ FINANCIAL DIGEST

At their annual get-together in May, financial analysts from all over the U. S. peered into their crystal balls. The question, posed by the *Journal of Commerce:* Where would prices on the New York stock market be in December.

"Bulls"—optimists of the market—outnumbered the "bears" three to two. Predictions were based on a market index of 30 industrial stocks (the "Dow Jones" average)—then hovering around 500. According to the bulls, the market would go as high as 550. The bears saw it dropping as low as 425. But all agreed there would be a lot of ups and downs.

Asked to name the stock groups most likely to outperform others this year, the consensus picked insurance as the top choice. Petroleum shares and office equipment followed; then came drugs and banks; and a small number spoke up for shipbuilding, steel, and aircraft.

Stocks groups in disfavor included air transport, automobiles, auto parts, building materials, distilling, food processing, nonferrous metals, rails, and textiles.

●

Swiss bank secrecy laws make life difficult for the U. S. Securities & Exchange Commission, which polices the buying and selling of stock in American corporations.

An executive agreement or treaty on the matter, suggested by the SEC, is not likely. But look for Congress to take some kind of action. The expected bill will probably rule out voting rights of unidentified proxies at corporate meetings. And to facilitate SEC investigations, the bill might set up a "quarantine" period to delay delivery of stock to financial institutions outside the U. S. A.

●

VARIG (Viacao Aereo Rio Grandense) is a fast growing Brazilian airline, and there is a financial story behind its growth. Ten years ago half the stock in the company was put into a Foundation for VARIG employees. As the company grew, the Foundation grew. Now, the Foundation gets 20-million cruzeiros a year out of the profits—and employees own another 30% of the airline's stock as individuals.

The Foundation makes interest-free loans to employees (6 million cruzeiros in 1955), runs a low mark-up store that saves employees 500 cruzeiros a month, and operates below-cost restaurants in three cities.

It owns a summer vacation resort in Ponta Grosso, another in Bahia for winter. Room and board is free, as is transportation—on VARIG planes. In addition, there is free medical service for employees and their families.

●

KLM, the Dutch airline, is the first European firm to use the American securities market for equity financing since World War II. KLM recently sold 250,000 new shares of capital stock for $6.75-million. . . . **The largest single overseas investment** by a German company since the war is the purchase of a controlling interest in Algoma Steel Corp. in Canada (for an estimated $25-million) by Mannesmann International Corporation, a subsidiary of Mannesmann A. G. Duesseldorf. . . . **Inflation finally caught up with Switzerland,** a stronghold of monetary stability. The bank rate was raised from 1½% to 2½%—first change in 20 years.

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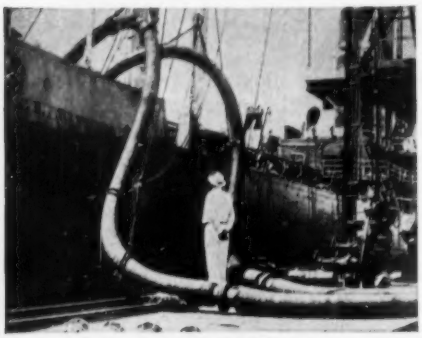

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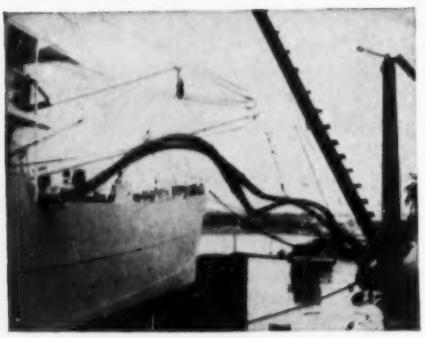

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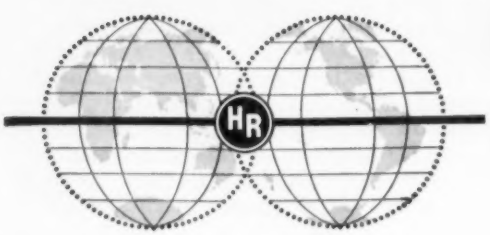

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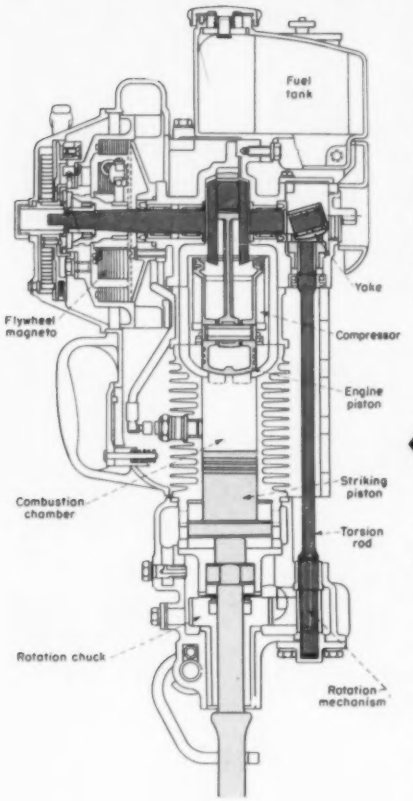
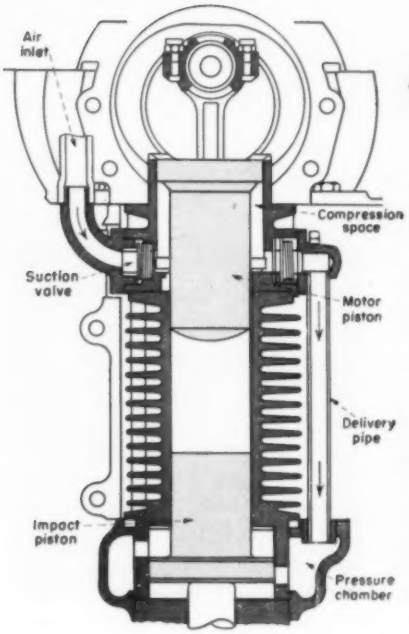
Free-Piston Engine Drives Drill



This new rock drill will put a hole in 13 feet of rock in 6.5 minutes. The drill-bit is driven and rotated by an opposed piston of an inverted gasoline engine. The engine piston also compresses air—used as a cushion beneath the striker piston, and to blow dust from the drilled hole. The complete unit weighs only 53 pounds and needs no other attachments. (Atlas Copco AB, Stockholm, Sweden)

Inverted engine is air cooled, displaces 70 cubic centimeters. Both engine and striker pistons are stepped. Engine has conventional 2-stroke cycle, with the combustion chamber between the cylinders. When the compressed fuel-air charge is fired, the striker piston is thrown against the drill. The engine crankshaft rotates the drill through a torsion rod.



Stepped engine piston compresses air in an annular cylinder space and discharges it to pressure chamber around the stepped striker piston. This chamber is kept under pressure, and is ported to the space beneath the striker piston to raise it when the combustion chamber exhausts. The air blast from the pressure chamber is directed through a nozzle and along a passage in the chuck and drill shank to the bit. The engine has a flywheel magneto, cooling fan, and floatless carburetor which works at angles up to 45°. The unit will drill holes 60 feet to 90 feet deep on one gallon of gasoline.

Dining a la Radar

A new method of preserving food, using radar microwaves, has the food industry talking. The process is still in the laboratory stage. But if it proves commercially successful it will be possible to store many foods—including delicacies such as lobster tails, breast of chicken, and strawberries—indefinintely without any loss of flavor, color, or form.

Here is how the process, developed by Raytheon Mfg. Co. (Waltham, Mass., U.S.A.), works:

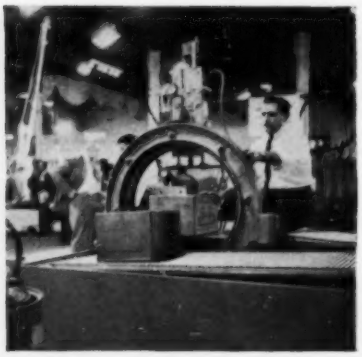
Meat, fish, fruits, or vegetables —cooked or uncooked—are frozen under vacuum. They are bombarded with microwave energy, such as is generated by a radar set. The microwaves penetrate the food particles and vaporize the ice. The food is then dehydrated.

Conventional dry-freezing requires high surface heat to achieve dehydration all the way through. This heat can damage the particles and impair flavor.

In the Raytheon process, the item retains its shape but loses the weight of the water removed. When the food is to be eaten, it is simply placed in water for a few minutes. After this, it both looks and tastes about as it did before freezing.

At present, the process is too expensive to be commercially practicable. But further development could make it of great value to large-scale food processors.

CONVEYOR SYSTEM features automatic transfer operation at work stops. (Allied Steel & Conveyors)



STRAPPER overwraps steel strap on carton as carton rides through on conveyor. (Gerrard Steel Strapping Div.)

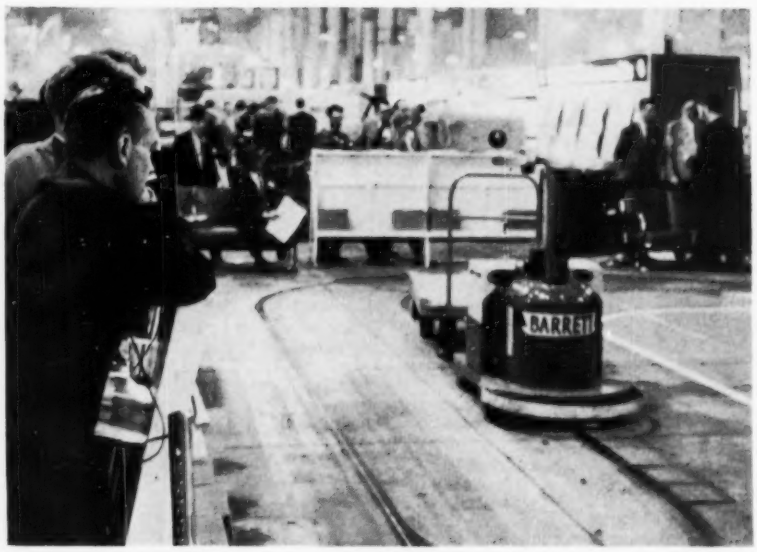
PUNCHED CARDS control assembly of shipping orders. Cartons come from storage. (Standard Conveyor Co.)

New Ideas in Materials Handling

The Seventh National Materials Handling Exposition, held in Philadelphia last May, displayed some 100 basic types of equipment ranging from simple plastic tote boxes and steel storage racks to giant cranes and complex conveyor systems. Some of the show's highlights are shown here.

Convention speakers were mainly concerned with the impact of automation on materials handling. They all stressed the need for simplifying, combining and standardizing methods to keep pace with developments in machining and automatic assembly.

Next month MANAGEMENT DIGEST will explore, in a special report, management's approach to the problems of materials handling; planning and organization, and selection of equipment are some of the areas to be discussed.



ELECTRONICS guide operator-less "Guide-O-Matic" tractor. Wires laid on plant floor form "track" for control of unit. One model can pull up to 10,000 pounds at a top speed of 6 miles per hour. (Barrett-Cravens Co.)

PALLET-TYPE STEEL BOXES set up quickly for in-plant materials handling. (Hamlin Metal Products Co.)

CONVEYORS move, transfer, store. Types include roller, inclined belt. (Rapids-Standard Co. Inc.)

AIR BLAST pushes bulk materials through pipes. Routing to different areas is simple. (Young Mach'y Co.)

PHOTOGRAPHED IN MEXICO, FROM THE PEPSI-COLA INTERNATIONAL PANORAMA MAGAZINE

Pepsi-Cola is there—*a sign of welcome in Veracruz as in Vancouver. Four hundred million people, in seventy-five countries, enjoy "Pepsi" today. In whatever part of the world a Pepsi-Cola bottling plant rises, the standard of living and enjoyment of living rise right along with it as well.*

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MORE PRODUCT DIGEST

Polyvinyl Chloride Fabrics for Industrial Filtration

Fabrics constructed of 100% polyvinyl chloride fibers offer effective answers to many filtration problems. Here are the properties which make these fabrics interesting to filter operators:

—They do not swell in water.

—Their tensile strength and elasticity are not affected by water or most aqueous solutions.

—They are not affected by concentrated acids, or alkalis, detergents, oxidants, salts, aliphatic hydrocarbons and alcohols.

—Their abrasion resistance is exceeded only by nylon and Dacron.

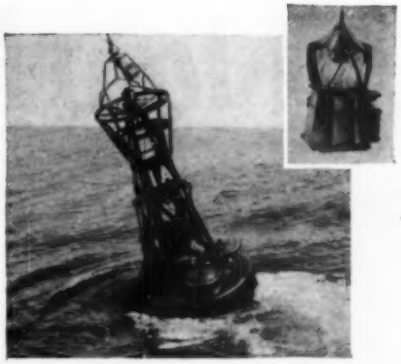
—They can be unplugged by washing with reagents.

In addition to using the polyvinyl chloride yarns in woven form, they can also be used as linters, wadding, flock or non-wovens. Filter media can be formed at the point of application by dispersing flock and using it as a precoat. **(Societe Rhovyl, Tronzille-En., Barrois, Meuse, France)**

Shaded-Pole Motor Has 40% Lower Sound Level

A new 5-inch diameter shaded-pole motor has 40% lower sound level than the previous design. Rated from $\frac{1}{40}$ through $\frac{1}{12}$ horsepower, the new motor is designed for home, hotel, and hospital appliances—such as vertical and horizontal unit heaters, console heating and cooling units, blowers, and other applications where minimum maintenance, quite operation, and extended life are essential.

In lowering the sound level, a new magnetic stator design makes possible both a reduction in decibels (quantity of sound) and a considerable lowering of frequency peaks (quality of sound), according to the manufacturer. This magnetic design decreases watts input from 7% to 20%, depending on motor rating, without sacrificing power output. **(International General Electric Co., 150 E. 42nd. St., New York 17, New York, U.S.A.)**

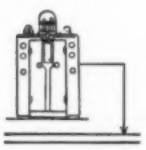


Where Performance Counts

WALLACE & TIERNAN EQUIPMENT IS USED

AIDS TO NAVIGATION

A W&T Buoy equipped with an electrically powered beacon, automatic lamp changer, flasher unit, and radio control equipment is shown above in service at a harbor entrance. Wallace & Tiernan equipment was chosen because of its dependability and economical operation. These qualities are typical of all W&T's navigational aids which include such items as lamp changers, flasher mechanisms, signal timers, fog horns, aircraft flasher units, and other related apparatus.



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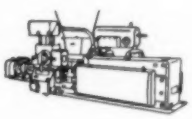
Equipment includes chlorinators of both the water and mechanical diaphragm types in all capacities, hypochlorinators, and many other auxiliary and accessory items designed for use in the treatment of water for sanitation as well as for numerous industrial purposes.



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Equipment includes chemical solution feeders, gravimetric and volumetric dry feeders, and gravimetric meters for use in the chemical, grain, and food processing industries.

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Equipment includes a complete line of aneroid and mercurial pressure sensitive instruments, such as altimeters, barometers, and manometers designed for use in industrial testing as well as for research purposes.

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NOW—New Thames Traders bring you the greatest ever combination of efficiency and economy—and that (as always) includes the World's *finest* service. Now, with Thames Traders you move *more* goods more efficiently, at *less* cost.

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MORE PRODUCT DIGEST

Color-Anodized Aluminum Sheet

A new color-anodized aluminum sheet product, called "Color-coil," is anodized on one side only. It is available in a variety of alloys in coils up to 48 inches in width, and in thicknesses from 0.020 to 0.064 inches. The anodizing produced by the new process results in a scratch resistant finish, which can be formed without damage.

The manufacturer expects the sheets to be used in the building industry, for exterior panelling and facades, canopies, door panels, spandrels, store fronts, ceiling panels; truck, bus and automobile bodies; and for household appliances where the trend is to color. Five fade-resistant colors—gold, yellow, black, blue and green, plus natural finish—are available for exterior applications. Many additional colors are available for interior use. **(Aluminium Company of Canada, Ltd., Sun Life Building, Montreal, Quebec, Canada)**

Battery-Powered Tractor

This compact battery-powered tractor can be used for both pulling and pushing operations in confined areas. The machine has a normal draw bar pull of 200 pounds and a break-away rating of 700 pounds. It has two speeds in both foward and reverse and will travel 2 miles per hour fully loaded and 3.2 miles per hour empty.

Fingertip control levers are placed on the steering handle. Although the tractor is designed as a "walkie" type, the operator can sit on the front cover for long runs. Two models of different lengths

are available. The PT-S, for single row battery, is 39¼ inches long, less coupler. The PT-D, for double row battery, is 44⅝ inches long, less coupler. Overall width of both models is 32 inches. **(Clark Equipment International, C.A., Buchanan 4, Michigan, U.S.A.)**

Wonder Cloth

"Gannex" is the name given to a new cloth said to be completely waterproof and windproof, light in weight yet providing adequate ventilation and preventing condensation. Built-in air channels hold air between the fibers and provide a heat-retaining layer around the body.

Gannex retains its insulating properties even when exposed to heavy rain. And when wet, it is much lighter to wear than a conventional wool. Furthermore, the manufacturer claims that the new cloth will not crease or pull out of shape, nor expand or contract when wet. **(Kagan Textile Ltd., Gannex Mills, Elland, Yorkshire, England)**

Mobile Rotary Drill

A new, high-powered mobile rotary drill, the B-52 "Pacemaker," handles auger boring, core and percussion drilling and soil sampling tasks all, the manufacturer claims, with equal speed and versatility. A "hollow stem" auger permits undisturbed soil sampling without withdrawing auger from hole. Drillers can now take samples without interrupting boring operations. Coring may also be continued through the hollow stem of the auger, when rock has been reached.

Self-powered, the drill can generate up to 5 tons push or pull ram force, with a twin hydraulic feed that responds to fingertip control. The unit handles 6-foot sectional augers in sizes from 3 to 24 inches and drives a full 6-foot stroke. It bores to 150 feet in unconsolidated materials, to 600 feet with "N"-type rods and 1000 feet with "A"-type rods. **(Mobile Drilling, Inc., Dept. 18, 960 N. Pennsylvania St., Indianapolis, Indiana, U.S.A.)**

FOUNDRY DOUBLES ANNEALING OVEN CAPACITY WITH LIFT TRUCK METHOD

Higher stacking increases oven capacity.

Five full cans weigh 3500 lbs.

WILLENHALL, ENGLAND—By using a Hyster 4000-lb. cushion tire lift truck, Charles Perks, Ltd. Foundry has doubled capacity of their annealing ovens, compared to former manual methods.

Larger Load Units

Manual methods limited size of annealing cans to 12" diameter, 13" high. The Hyster lift truck has made possible larger load units—cans 15" diameter, 18" high—and stacks them over 6 feet high. Using the lift truck, which is equipped with a Load-Grab Clamp (with special arms) one woman operator can load and unload ovens, double productive capacity, and release men for other work in the plant.

This is a typical example of how a Hyster materials handling specialist can solve production problems. Your Hyster Dealer makes it his business to keep up with materials handling progress in every industry. He can help you to reduce your handling costs materially. Call him today, or write direct.

Unloading five cans at once.

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Trailer-Mounted Diesel Generating Plant

Rated at 675 kilowatts for continuous heavy-duty service, this complete, self-contained plant meets size and weight requirements for over-the-road movement. There are three smaller trailer-mounted models available: 350-, 400-, and 500 kilowatts. The diesel is a six-cylinder, 962-horsepower, opposed-piston type in the larger unit, and a smaller version of the same opposed-piston design is used in the smaller generators. **Fairbanks-Morse & Co., 10-01 State Highway 208, Fair Lawn, New Jersey, U.S.A.)**

Moisture Indicator for Refrigeration Servicing

The "Super Dry-Eye," a combination moisture indicator and sight glass, has been developed to enable refrigeration service engineers or equipment owners to detect basic refrigeration system trouble in its earliest stages and prevent costly breakdowns. The unit is a T-shaped brass fitting with two moisture indicating elements, one for Freon-12 and another for Freon-22.

The moisture-indicating element for Freon-12 shows blue in color when the refrigerant is dry and in safe operating condition—that is, when moisture content is below 10 parts per million. When this element turns pink, the refrigerant is dangerously wet, above 30 ppm. For Freon-22, the indicating element is green when dry (below 20 ppm); and pink when wet (above 25 ppm).

The circular fused glass window through which the moisture indicating elements are visible also serves as a sight glass. Bubbles in the flowing refrigerant indicate a low refrigerant charge or a restriction in the line. **(Ansul Chemical Co., 101 Stanton St., Marinette, Wisconsin, U.S.A.)**

High Melting-Point Wax Derived From Coal

An exceptionally hard wax from South Africa has a melting point of 214° F., as compared to 150° F. for the upper limit of conventional paraffin waxes. This special property, coupled with low cost suggests these uses for "Paraflint":

—**As a chemical raw material.** Purity and economy of this hydrocarbon open a new field for chemical products heretofore not commercially possible. The new wax seems a useful raw material or intermediate for further chemical processing, such as oxidation-esterification, chlorination, and sulfonation.

—**As a petroleum wax modifier.** It is an excellent opacifying agent and crystal modifier for paraffin wax. It improves scuff, blocking, grease and dust resistance, hardness, tensile strength and gloss stability in paper coatings using paraffin or microcrystalline waxes.

—**In plastic and rubber processing.** It shows possibilities as a detackifier, lubricant, hardening agent, and as a finishing aid.

—**In polish formulations.** It combines excellent hardness characteristics with water resistance and the ability to take on a high shine when buffed. **(South African Coal, Oil & Gas Co., P. O. Box #1, Sasolburg, South Africa)**

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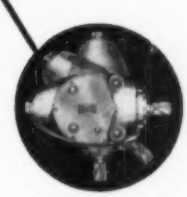
give you accuracy speed—economy

One investment in a Van Norman miller or grinder gives you the exactly right machine for *your* needs. And all Van Norman millers and grinders are designed to help you keep production up and costs down.

VAN NORMAN 28A combination milling machine—designed to let you do horizontal, angular or vertical milling on one machine. It gives you maximum accuracy, rigidity and cutability — reduces tooling and milling costs, increases production. Table size 58" x 13". Cutterhead motor 7½ HP.



Van Norman adjustable cutterhead minimizes work reset-ups, cuts idle machine and operator time.

VAN NORMAN 418 cylindrical grinder — designed for accuracy, speed and economy in precision plunge or traverse grinding of small parts. Setups are quick and easy . . . workpieces are easily loaded.

Work size: 4" diam. x 18" long
Grinding wheel: 14" O.D. up to 2" width face
2 HP wheel motor — 3 HP optional

Get complete details on Van Norman Millers and Grinders — write today for descriptive catalogs.

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Heil can be your key to steady profits in the multi-million dollar summer air-cooling business. The line is complete, with capacities to fit both residential and light commercial buildings. Both 50 and 60-cycle units are available, to operate either as independent coolers or as part of a central warm air-heating system.

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Every Heil unit is backed with 30 years of experience and leadership. For alert, aggressive dealers who want to build a profitable heating and cooling business, now is the time to get in touch with Heil.

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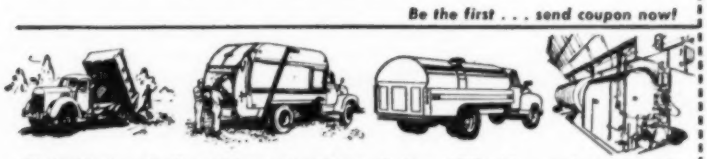

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Heil plants at Milwaukee, Wis.; Hillside, N.J.; and Lancaster, Pa., have more than one million square feet of manufacturing space and produce quality products for more than 50 different businesses and industries.

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MORE PRODUCT DIGEST

Synthetic Rubber Tank Lining

A ready-to-apply synthetic rubber lining for tanks and chemical equipment has good chemical resistance to inorganics such as hydrochloric and sulfuric acids, ferric and aluminum chlorides, and to organics such as benzoic, tannic, and tartaric acids. (It is not recommended, however, for protection against petroleum products.)

Because the sheets are vulcanized during manufacture, installation is relatively simple, since air-drying will cure the cement without heat. Equipment and tanks can be lined or re-lined in place, without expensive equipment.

The new tank lining, called "Fairprene" T-5594, is available at present in continuous pieces 50 inches (1.27 meters) wide, ⅛ inch (.32 cm) thick, and 20 to 25 yards (18.3 to 24 meters) in length. Also available are specially-developed primers, adhesives, and a special putty for use with the new material. **(E. I. du Pont de Nemours & Co., Wilmington 98, Delaware, U.S.A.)**

Nucleonic Device for Level Control

Level control, density, liquid interface and flow failure detection are examples of the type of control which can be achieved with the new GammaSwitch.

As the name indicates, the device is a switch rather than a precision measuring instrument. It consists of a Halogen quenched Geiger-Muller tube in circuit with a simple relay, built on a printed circuit chassis and contained in a fireproof or weather-proof cast case.

An example of a suitable application of the GammaSwitch is the control of high and low level of material in a hopper. A switch is mounted at the appropriate level outside the hopper, and a gamma ray source is mounted on the opposite side. If the relay is set to trip when the radiation penetrating the hopper changes by the amount absorbed by the material in the hopper, a warning light or

buzzer can be operated by the switch whenever the material passes the predetermined level. **(Isotope Developments Ltd., Beenham Grange, Aldermaston Wharf, nr. Reading, Berks., England)**

British Baby Bubble Buggy

Britain is entering the baby "bubble-car" market with this "Frisky." Capable of seating two adults and three children, the car weighs only 670 pounds. With a full tank of 3¼ (Imperial) gallons of gasoline, the Frisky can travel over 220 miles. It cruises at a steady 50 miles per hour, and the average consumption, under touring conditions, is at least 75 miles per gallon.

The overall dimensions of the body are: length, 9 feet 8 inches; width, 4 feet 8 inches; and height, 4 feet 3 inches. **(Henry Meadows Ltd., Fallings Park Works, Wolverhampton, England)**

Self-Cleaning Air Conditioner

A new system for air conditioning large industrial areas features a spray-type air conditioning unit. Called the Rotaspray Weathermaker, the new device is designed for overhead installation.

The air conditioner incorporates a "spin dry" principle to remove water droplets, lint, other foreign matter. Lint and airborne particles are scrubbed from the air by a "hurricane" of water droplets. Finer particles are collected by the eliminator and flushed from its surface by the water removed from the air stream. All removed lint and particles are carried in the water stream to the separation tank. **(Carrier Corp., Syracuse 1, New York, U.S.A.)**

Electric Plant

A new lightweight, portable 5,000-watt direct current electric generating plant is completely self-contained and will provide full-capacity direct current power to operate lights, electric tools, and universal motors.

Prime mover for this plant is the Onan 2-cylinder opposed, 4-cycle, air cooled, gasoline engine, Model CCK, rated at 12.9 horsepower. It is specifically designed for smooth running, heavy-duty operation. Of drip-proof design, generator is rated at 5,000 watts, 115 volts direct current. Total weight is 315 pounds. **(D. W. Onan & Sons Inc., 2515 University Ave., S. E., Minneapolis 14, Minnesota, U.S.A.)**

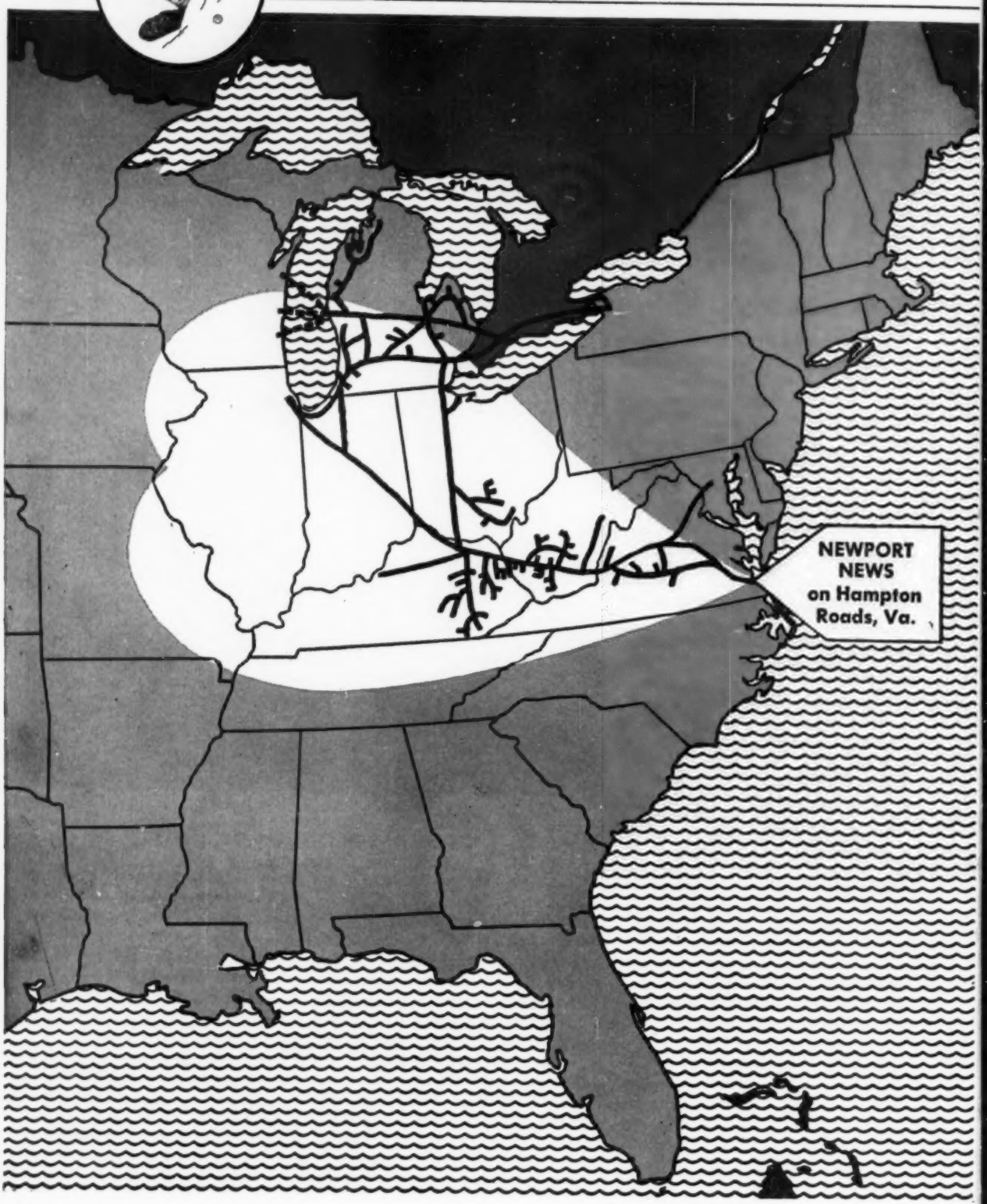
Snaking Conveyor Belt

This snaking conveyor belt climbs, twists, and turns in three-dimensional maneuvering. A rubber belt, which is folded at spaced intervals and vulcanized on to trough-shaped steel crossribs, negotiates curves and spirals with a radius as small as 10 feet. At the same time, the belt will climb a grade of 30° with a load.

The belt's steel cross-members are fastened to die-forged roller carriers, each of which is designed with two horizontal guide rollers and one vertical carrier roller that ride the U-shaped track of the conveyor trestle. An electric motor, or a compresed-air motor, drives a steel chain fastened to the centers of the folded cover sections to move the belt. The ability of the folded belt to compress and extend at the folds makes it possible for the conveyor to negotiate three-dimensional curves.

The conveyor is available in capacities of 260, 325 and 400 cubic yards per hour at speeds from 2 feet 8 inches to 4 feet 6 inches per second. **(Gevekschaft Eisenhuette Westfalia, Wethmar, Post Lunen, Germany)**

SHIP THROUGH NEWPORT NEWS..



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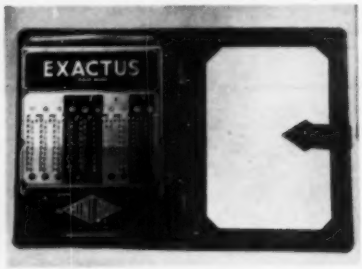
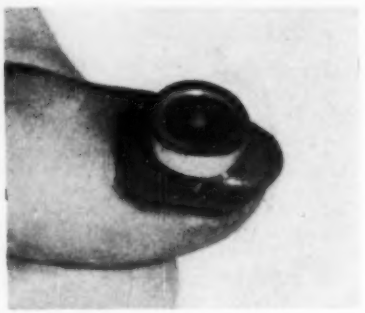
MORE PRODUCT DIGEST



Pocket Adding Machine

The Executive adding machine calculates in British monetary units. It is enclosed in a leather wallet that is easily carried in the pocket and is operated by inserting a stylus into small holes on the machine's face, and moving them up or down somewhat the same way an abacus is operated.

The machine is of all-metal construction. It adds and subtracts up to a total of £999,999 19s. 11¾ d. **(Exactus Business Machines, 2/3 Victoria Chambers, Luke Street, London, E. C. 2, England)**



Miniature Battery

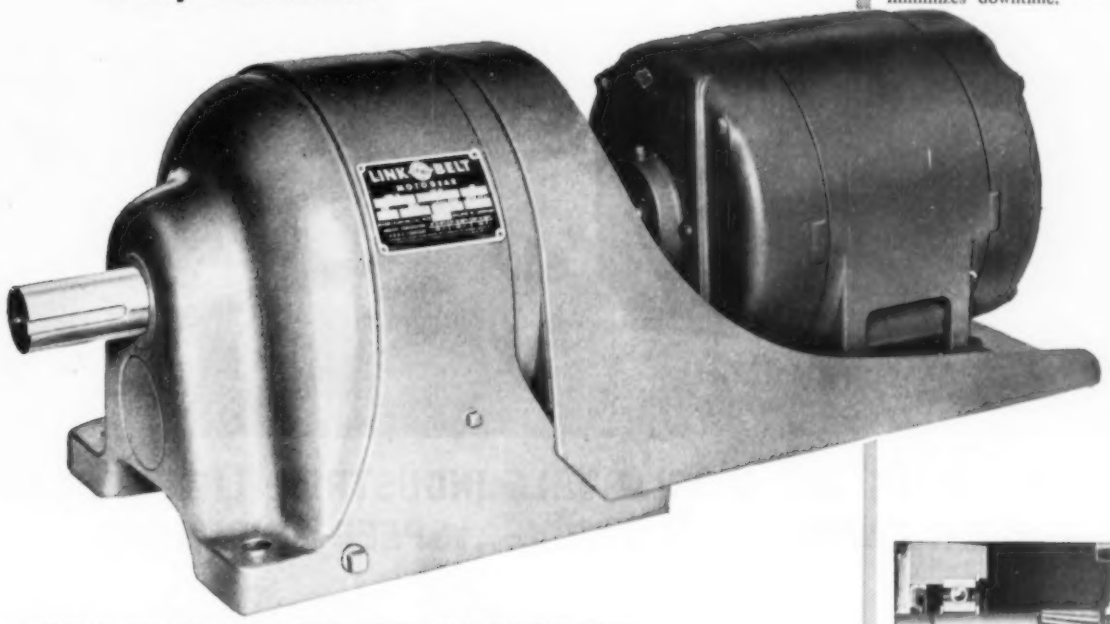
Eveready W-307 energizer is said to be the smallest battery of its type mass-produced. It is designed to satisfy the demand for a miniature "power plant" for many small sub-miniature electrical devices.

The battery weighs only 1/20 of an ounce; it is 0.44 inches in diameter and ⅛-inch thick. Nominal voltage rating is 1.5. Made exclusively of non-magnetic materials, the unit withstands shock, vibration, and acceleration. It uses standard dry-type battery ingredients in a highly refined form. **(Union Carbide International Co., 30 E. 42nd. St., New York 17, New York, U.S.A.)**

NEW...EFFICIENT RUNNING MATE

for latest NEMA motor sizes...

LINK-BELT Motogear designed for bracket-mounting foot-type motors of any manufacturer



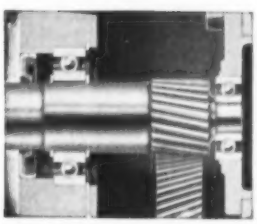
EASY MOTOR REPLACEMENT—Remove four mounting bolts and separate coupling. Oil drainage is unnecessary. Sturdy bracket design aids motor re-alignment.

ABILITY TO ACCOMMODATE A WIDE RANGE OF MOTORS meets emergencies, minimizes downtime.

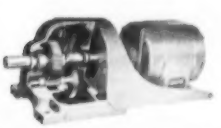
Immediately available from stocks—new Link-Belt Motogears in sizes up to 60 hp, output speeds from 280 down to 6 rpm.

Wherever space is restricted . . . where downtime means a costly break in production continuity—Link-Belt Motogears soon pay their own way. In addition to easy motor replacement—simplified ratio changes and quick accessibility of parts for maintenance offer major service savings.

Contact your Link-Belt representative for facts. Ask, too, about the new flange-mounted Gearmotors stocked in sizes up to 30 hp. Or write for Book 2447, giving details of both.



RIGIDITY of high-speed shaft and pinion is provided by straddle-mounting — extremely important in coping with shock, reversing or heavy loads.



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NEW PRODUCT BRIEFS

Coin Automat—A small coin-operated coffee automat grinds coffee beans before the customer's eyes, then filters the ground with boiling fresh water. Within about one minute, a cup of high quality coffee is served. The unit is called "Expresso Bar." **Berliner Stanzwerk, Berlin S.W. 29, Germany)**

Fatigue Testing Machine — A midget Pulsator fatigue testing machine gives alternating tension and compression loads up to a maximum of 660 pounds and is suitable for push/pull testing of steel, cast iron and non-ferrous metals. Bending loads can also be applied for testing beams and other structures. **(W.&T. Avery Ltd., Birmingham 40, England)**

Aluminum Cleaner—Cleaner removes identification inks, greases, oils and other heavy soils from aluminum. Called Aluminum Cleaner No. 164, it has been specially compounded to clean without foaming in agitated tanks. It is completely safe on aluminum and its alloys. **(Oakite Products, Inc., 19 Rector St., New York 6, New York, U.S.A.)**

Cartridge Hammer—"Rapid Hammer" is a breech-loading cartridge tool capable of driving hardened steel nails and bolts into concrete, steel, and brickwork with safety. The cartridge cannot be fired until the muzzle shield is flat against the surface. **(Explosive Power Tools, Ltd., Dukinfield, Chester, England)**

Strengthens Cement — Called Placewel, a new additive imparts additional strength to conventional ready-mix cement. It is a liquid composed of amine salts of complex alkyl and aryl hydrocarbons, along with possible condensation products of unknown composition. It is a water-reducing and air-entraining agent. **(Johns-Manville International Corp., 22 East 40th St., New York 16, New York, U.S.A.)**

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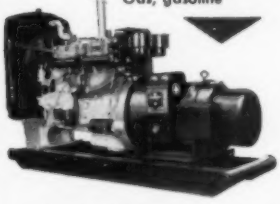
145 SERIES—45-110 KW
Gas, gasoline



A superb line of Enginators— backed by over 50 years' experience in building heavy-duty engines and electrical equipment. For reliable performance on all fuels, these accurately balanced Waukesha engine-generator combination units supply smooth, steady power in continuous, intermittent and standby service.

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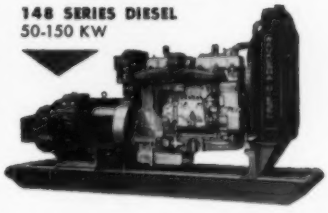
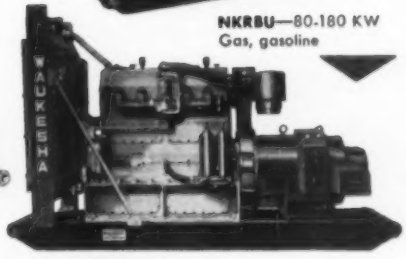
50-150 KW



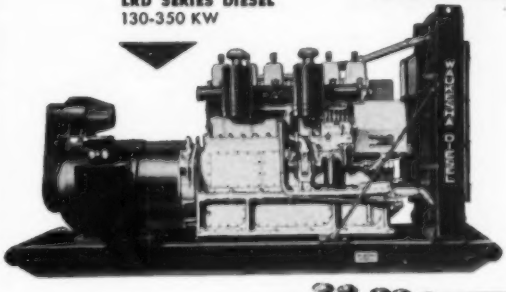
WAKD SERIES DIESEL
75-210 KW

WAK SERIES—75-170 KW
Gas, gasoline

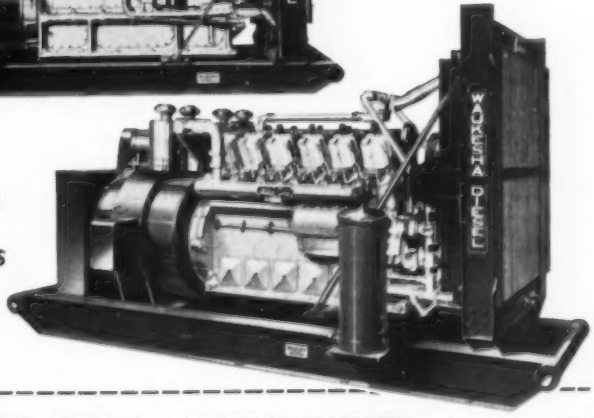
NKRBU—80-180 KW
Gas, gasoline



LRD SERIES DIESEL
130-350 KW



VLR SERIES—250-730 KW
LPG, natural gas, Diesel



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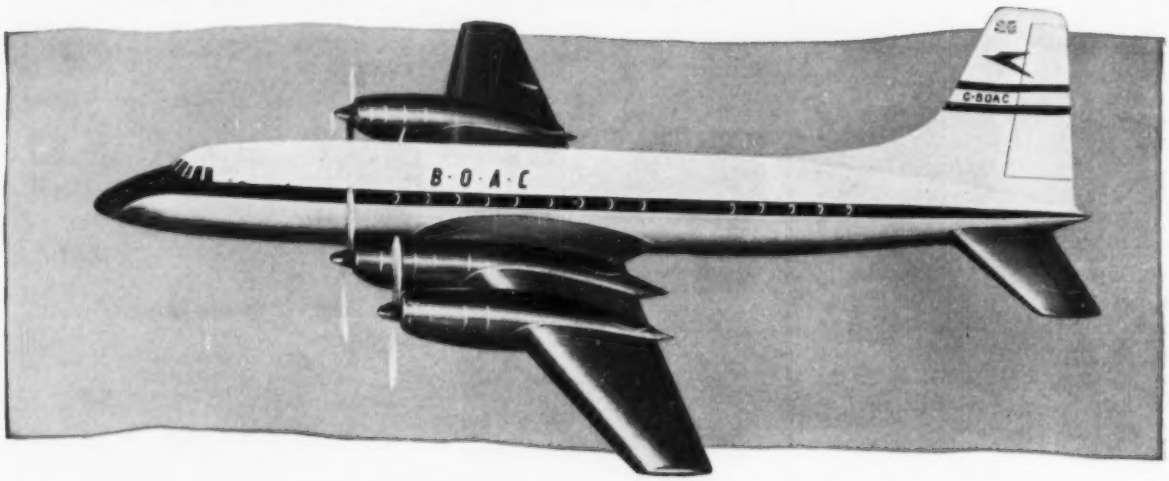
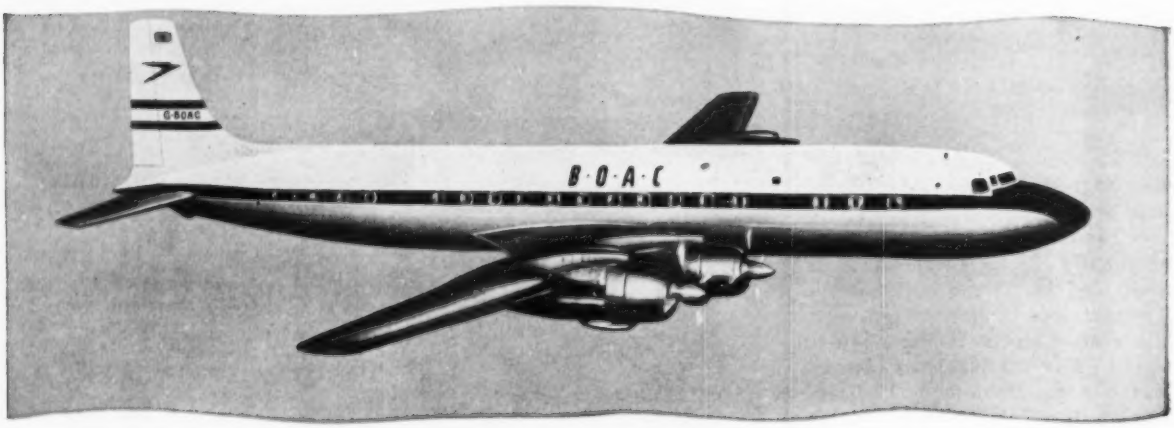


Britannia AND DC-7C



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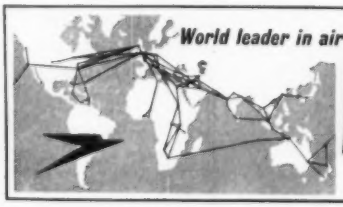

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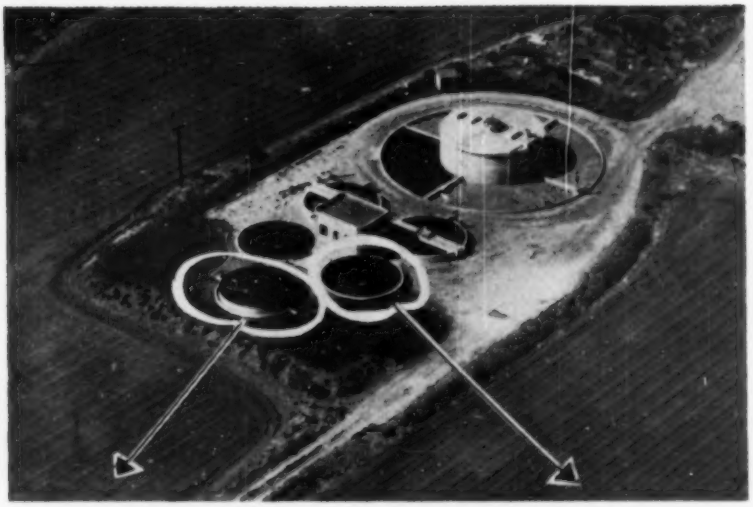

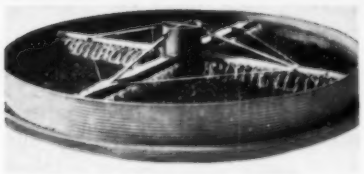

Superate shallow rock filter . . .

Spiral flow for mixing in . . .

Treatment Process for Small Plants

The SpiroVortex system is offered for complete treatment of domestic sewage and intermediate treatment of industrial wastes. The newly developed complex is particularly applicable to new plants treating 1 million-gallons-per-day or less.

Working on the same principle as the activated sludge process, the system is said to effect over 90% biochemical demand (BOD) removal and have extremely high recirculation rates. A typical set-up shown (picture) involves, from left to right, aeration in 30-foot diameter SpiroVortex or—mixing—tanks, two stages of clarification and separate sludge digestion.

Conventional practice is followed in the primary clarification and sludge digestion steps. First stage of the secondary treatment, however, is mixing of the primary SpiroVortex tank. In this tank, feed is introduced tangentially, forcing it to spiral toward the center as it is mixed. The mixture is drawn off from the central vortex, combined with part of the flow from the secondary spiral-mixing tank and pumped to the superate filter for aeration.

A high-capacity rotary distributor spreads the sewage over the shallow rock filter bed. Filter effluent is split, with controlled flows fed to each of the mixing tanks. After additional contact time in the secondary mixing tank, the liquor is removed, at the vortex, and recirculated to the filter. Recirculation rates are determined by the BOD strength of the raw sewage.

Part of the flow from the secondary mixing tank becomes treated effluent after clarification in the secondary clarifier. Underflow sludge from this unit is returned to the primary clarifier or recirculated to the primary mixing tank.

The system is also recommended for use in expansion of existing plants where it is feasible to divide the flow to the secondary stage. **(Dorr-Oliver, Inc., Barry Place, Stamford, Connecticut, U.S.A.)**

Price Marking System

The Midget Price Marking System automatically imprints in giant and standard size type such information as price, weight, number, tax, totals, and other selling information on various type labels, tickets, and tags. Imprinting is accomplished at the rate of 220 per minute.

Both hand and motor models are available. The hand model weighs 15 pounds and measures 9 by 10 inches square. The motor-driven Midget weighs 30 pounds, with dimensions only slightly larger than the hand model. **(A. Kimball Ltd., 279 Northfield Ave., Ealing, London W.5, England)**

"Silent" Television

A television receiver has been designed to be suspended from the ceiling and to beam a picture on to a 4 by 3-foot screen. The receiver, the Nera, is intended to be used in conjunction with a new unit which enables the "sound" part of television programs to be divorced from the picture and relayed to individual headphones. **(Hadley Telephone & Sound Systems, Ltd., 72 Cape Hill, Smethwick, Birmingham, England)**

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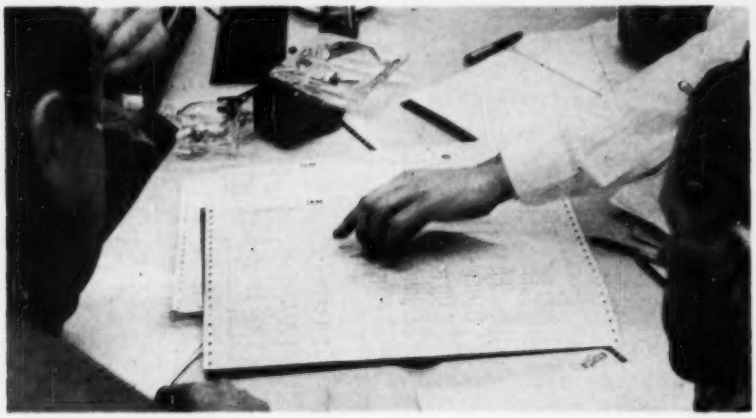
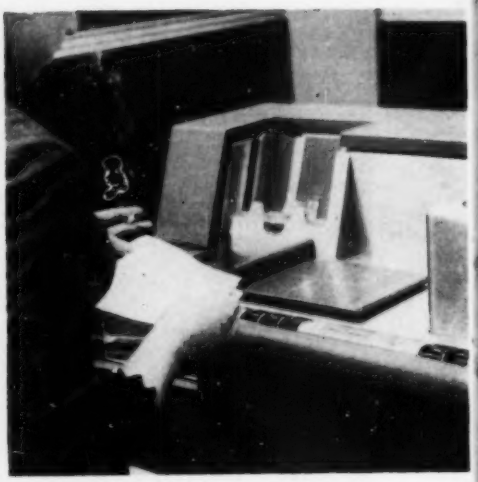


MANAGEMENT TEAM—one of five—ponders decisions on production, price, expenses in new business game developed as aid in teaching decision making.



TEAM'S DECISIONS are fed into a computer that controls the "market."

Learning to Make Better Business

Information on decision making has been collecting for years. American Management Assn.'s new business "war game" may help managers understand the process.

A few weeks ago, five groups of men—representing mythical corporations—labored long and hard in meeting rooms just off New York's Times Square. As they worked, officials of the American Management Assn. anxiously plotted the results: How do the "corporations" shares of the market compare, how do their profits, sales, marketing investment add up? This was the crucial test of a new "business war game," and of an important theory of management decision-making.

Some of the teams were made up of mathematicians who helped construct the game "model;" others were made up of operating executives. Could the executives, basing their decisions on business principles, hold their own against the mathematicians?

After 10 years (40 quarters) of the game—actually played over two days—the AMA was satisfied. The business "war game" worked.

Calling the first press conference in AMA's history, officials proudly announced that the game "promises to become one of the most valuable tools ever devised for management—from top management down to supervisory levels."

Why all the fuss?

The AMA game may provide a "breakthrough" into a new era of scientific management. Here is a living laboratory for studying and teaching what is obviously business's most essential skill.

Today's attempt to understand how decisions are actually made—and how they can be best made—is concentrating on group action, not individual abilities. Decisions are becoming more and more the product of a team effort.

The basic elements in decision-making are known. Harvard sociologist Robert Bales says there are three steps—easy to list, but difficult to follow in action:

1. What are the facts?
2. How do we feel about them?
3. What shall we do about the problem?

And the steps must be taken in order. In practice, of course, there is a lot of backtracking—when disagreements go too far, you have to go back to the facts.

As in real life, these steps must be followed in AMA's business game.

Like many games, AMA's brainchild is easier to play than to describe. The five teams manufacture the same product. At the start of the game, each company has the same assets, share of the market, production and inventory; and charges the same price. The exact nature of the product is unknown, as are the characteristics of the market. Each team makes its decisions for one business quarter—how many units to produce, what price to charge, how much to invest in marketing, and in research and development. Productive capacity can be sold or added, at a fixed cost.

The game is "controlled" by a computer. It is possible to program the computer with a wide range of economic conditions—cycles, seasonal factors, chance factors, even a depression. At present, however, only one game model has been programmed. This model has a "growth" factor built into it—the total market grows by about 1% a quarter. The companies—or players—must recognize market conditions from the results of their decisions.

Another competitive factor: Market information can be bought. At the end of each quarter, each team gets an income and profit statement, and is told its own share of the market and the price charged by each company. For a fixed sum, it can find out what share of the market each company has. Other "market data" can also be "bought."

The computer operates according to the "principles of classic

COMPETITIVE position and share of market change as result of decisions.

Decisions

economics," and that is all the players are told. The computer works from punched cards, which are quickly prepared after each decision period. Then the computer feeds its information to a printer, which turns out a new working sheet showing the company's position and decision alternatives for next quarter.

As for the validity of the game as a teaching device, the AMA rests on the point that businessmen can beat the mathematicians familiar with game theory. Operating managers who have played—and one demonstration was played by teams composed entirely of real-life company presidents—note close similarities to the business world. For one thing, they point out, the game is truly competitive. Success depends on interpreting the results of past actions, and judging the actions of the competitive companies.

There are plenty of lessons to learn from the game, players report. "The greatest lesson," a railroad president commented, "is that you have to have facts to make good decisions. And to have facts, you have to pay for them."

Another point frequently brought out in the post mortems: Operations have to be kept within balance. And one of the most common errors—particularly in the early stages of play—was too much concentration on tactics, too little on strategy.

In other words, the game demon-

Story continues on page 43

The AMA Goes International

THROUGH the International Management Association — an affiliate of the American Management Association — management men from all over the world participate in the world's largest nonprofit management association. They can attend conferences, improve their decision-making, subscribe to proceedings and publications, and make use of the AMA's Management Information Service.

Organized less than two years ago—by simply transferring names from AMA's membership rolls, including over 3,000 executives from outside the U.S.A.—IMA concentrated first on an exchange of information by its American members from the international divisions of U. S. companies. It was easy to assemble conferences, and the demand had been building for years.

But now the IMA is struggling to become a truly international management association. Currently, Manager Frederick E. Pamp Jr. is on a two-month visit to Europe, talking to IMA members and interested executives to find out how IMA can help them.

If Pamp finds the same enthusiasm in Europe for management education that he found on an earlier trip through Latin America, European managers will be hearing more of the IMA.

As a result of Pamp's Latin American visit, IMA is now busy assembling a staff to give management courses in that part of the world. To begin with, IMA will provide the staff on a contract basis, working with Chambers of Commerce and other management groups. If the experiment generates enough demand, Pamp predicts an IMA division will "find a home and settle down" in Latin America.

Members of the IMA enjoy the same privileges as AMA members. An individual membership costs $50 a year; for companies, it's $300 (subsidiaries of AMA member companies pay a little less, $250).

The association's Management Information Service maintains a library of 13,000 books and 100,000 periodicals and clippings on business subjects, plus varied examples of organization charts, job descriptions, company policy statements, and manuals.

If members can get to New York, the special conferences and courses are open to all. The Management course—"based on the premise that management is a profession in itself, with its own body of principles, skills, and tools"—is packaged in four one-week units, which can be taken consecutively or within a 12-month period. The Executive Action course—devoted to "individual effectiveness"—is taught in three one-week units, as is the course in Marketing. Fees are $750 for the four week course, $600 for three week courses; travel and living expenses are not included.

The AMA—and its international affiliate—is a nonprofit educational organization, devoted, as officials are fond of saying, to education "of management, by management, for management." It is not a trade association, "spokesman" for business, or consulting service.

During the year, 80,000 managers will take part in at least one AMA conference or course. AMA's New York headquarters takes in three floors, with 30 meeting rooms, in the Sheraton Astor Hotel in the heart of Times Square; its "campus" used to be the famous Astor Roof night club. But ask any of the average 700 members who attend seminars in New York every week: "Don't be fooled by the Times Square atmosphere," he will say, "we come to work."

In the summer, the AMA shifts its activities to Colgate University, and its own conference retreat. Conferences are also held in regional centers.

If you are interested in the group's work, write to: International Management Association, 1515 Broadway, New York 36, New York, U.S.A.

THIS CAR IS NOT FOR SALE...

This is the travelling lab of the Régie Renault.This car made history at Salt Lake by setting a new all-time speed record for turbine equipped cars, but it was not merely a matter of prestige for Renault.

It is a fact that the engineers who designed the Etoile Filante are proud of this nearly 192 MPH performance which was attained right at the start. However, their aim went beyond this spectacular achievement. They wanted to (actually they **had** to) find out how this "car of to-morrow" would behave at speeds of "after to-morrow".

These men are preparing the years ahead.In several years from now, you will find it normal to start on a journey in your turbine car. This car will probably have a faint likeness only with the Etoile Filante but your safety behind the steering wheel will have been warranted by these engineers who sometimes risk their life and always do their utmost to foster automobile engineering development.

Well, **these same engineers** are offering the **Dauphine,** now.

They have engineered into this last born achievement of the French industry, all the technical refinements which could be used at this time for large volume production.

This explains why the Dauphine has been enthusiastically greeted by all experts of the Automobile Press.

This also explains why this car already achieved such outstanding results in the first competitions in which it took part : the Mille Miglia in Italy, the Tour de France, the Tour de Belgique and the Tour de Corse.

This is why its success among the large public went beyond the most optimistic estimates.

This is the reason why

THE RENAULT DAUPHINE SETS THE PACE IN YEARS-AHEAD CARS

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strates the basic principles of making business decisions. And these principles will be emphasized in the AMA course based on the game.

As a research tool, AMA's business game should throw light on how conflicting opinions can be settled, but with differences in viewpoint preserved. A frequent block to decision-making is incompatibility among committee members. The trouble with incompatible groups, Psychologist William Schultz says, is that they cannot decide on how decisions should be made—and the decisions are put off, avoided, or made with no compromise.

In a pioneering study of the effect of size on committee action, Sociologist Robert Bales observed that the most efficient committees have four to seven members, preferably five. So it is no coincidence that the AMA game is usually played with five-man teams. These teams organize themselves any way they see fit. Some elect officers, others a committee chairman, others delegate staff and line functions. In post-mortems, merits of various types of organization can be debated.

But Bales also contributed a genuine insight into this problem. He observed that successful committees, regardless of their formal organization, usually have two leaders.

There is a task leader who keeps the members working on the task at hand. The task leader, understandably, is seldom the most popular member of the committee. He creates friction and disunity; indeed Bales points out that too much agreement is harmful to effective decision-making. As a counterbalance to the "task leader," the "social leader" restores unity and group spirit. Both are essential. Most chairmen, wanting to be popular, prefer to be the "social leader."

But it makes no difference which role the chairman plays, as long as both leaders are present. Bales suggests that the two leaders get together and work deliberately as a team. There is evidence that companies are beginning to heed Bales' advice—and not only for "group" decision-making. In the past few years, a number of highly successful corporations have become known for their two-man top managements.

There are still a lot of unanswered questions about decision-making. What problems should be turned over to committees for a group decision?; which are best left to the individual judgement of the "boss?" One man must take final responsibility; that is the problem.

How are decisions actually made? The decision-making process involves hunches and intuition, trial and error, logical systems. This problem is being studied at the Carnegie Institute's Graduate School of Industrial Administration in Pittsburgh, Pennsylvania (U.S.A.). The study has already turned up some interesting findings. For most companies, Professor Herbert Simon finds, the crucial decision is to start a formal study of a project or problem. Whether the problem is employee benefits or a computer system, the chances are that the project will go through. Simon says the reason is simple: Most companies follow a few bellwether companies. What these companies do become "hot" subjects—and decisions are predetermined for hundreds of other companies. ●

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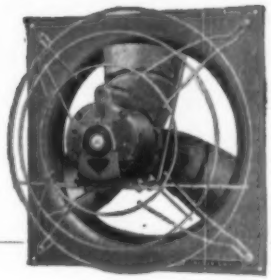

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Production men and inspectors often carry on a cold war. Understanding their problems will help maintain quality control.

Cold War in the Factory

Digested from METALWORKING PRODUCTION, May 3, p771

The relationship between inspection and production men has traditionally been strained, and it is likely to be more so in the modern plant. Today, quality control is concerned with processes and people, not just finished products.

First of all, it is important to recognize that inspection is a control function. The inspector has considerable "power"—but the production man usually has a higher rank. The inspector reports upward about production, but production men do not report upward about inspection. So some resentment is natural.

The complaints that production men make about inspectors are surprisingly similar from plant to plant, industry to industry.

"The inspector can't do the job himself, so he shouldn't be in a position to criticize."

"The inspector sets arbitrary standards."

"The inspector hasn't got his feet on the ground about costs."

However, the most frequently heard accusation against inspectors is that they are inconsistent. Natural resentment is present here too, but there is also a good deal of truth in the accusation.

In a series of controlled factory tests, inspectors were much less consistent than expected.

—Inspecting 50 subassemblies for visual faults, an experienced female viewer rejected 10% in one day, but 18% of the same batch the next day. A male inspector rejected 25% of the same batch.

—In a batch of 25 electronic parts, three inspectors checking the noise level rejected 11, 3, and 5 respectively.

And inconsistency was almost as great in a more objective inspection—gauging internal bores with a micrometer.

There are often very simple reasons for inconsistency. For one thing, social factors are important. Inspectors tend to develop their own "norms." A belief arises that a certain percentage of parts is likely to be bad.

Cost factors influence judgments. If the process is relatively expensive, inspectors tend to turn back fewer rejects.

If the inspector works alongside the repairman, his judgment is influenced. Assuming they are on good terms—and normally they will be—the inspector will tend to reject less when the repairman is busy, more when he is not.

Sometimes inspectors are given different instructions, or even no clear instructions at all. It would seem obvious that the judgment of inspectors must be "calibrated", particularly for subjective judgments. But often this is not done.

The first step in improving inspection standards is to determine how much inconsistency there is; then a training program for inspectors will help. But the biggest problem is the "natural" antagonism to inspection.

When inspectors themselves are subjected to inspection—as in government contracts—they make the same complaints that production people make. And when there is a conflict between production and inspection, production supervisors react as production men, not supervisors, and supervisors of inspectors react as inspectors.

This is the stalemate that must be broken. And it is a question of organizational structure, not "personalities." ●

	Today	1 Week	1 Month	3 to 6 Months	1 Year	2 Years	3 to 4 Years	5 to 10 Years
President	1%	2%	5%	17%	15%	25%	30%	5%
Vice President	2%	4%	10%	29%	20%	20%	13%	2%
Works Manager	4%	8%	15%	38%	20%	10%	5%	
Superintendent	6%	10%	20%	43%	10%	9%	2%	
Department Manager	10%	10%	25%	39%	10%	5%	1%	
Section Supervisor	15%	20%	25%	37%	3%			
Group Supervisor	38%	40%	15%	5%	2%			

Good Managers Think Ahead

How a manager spends his thinking and planning time depends on his responsibilities. All levels of management above the group supervisor spend a good deal of time planning three to six months ahead—and even the group supervisor spends 5% of his time worrying about problems coming up in three months. But interest in the long term increases as you go up the ladder of management; interest in the short term increases as you go down. Every company has its own problems, but any major shift from the above pattern might indicate that some phase of planning and control is being neglected. The chart is adapted from material used in a management workshop held by the American Management Assn.

This basket-filling routine illustrates . . .

Elements	Time Per Variable Factor	Variable Factors Per Basket	Time (min.)	How Often Per Basket	Time Per Basket
Get basket			.2	1	.20
Get lids			.4	1/10	.04
Fill basket	.01 min./lb.	60 lb.	.6	1	.60
Weigh			.4	1/20	.02
Put on lid			.1	1	.10
Put in storage	.03 min./ft.	30 ft.	.9	1	.90
				Total time per basket	1.86 min.
				Output per hour	32 baskets

Setting Labor Standards

Digested from FOOD ENGINEERING, May, p56

The chart above shows a labor production standard for a basket-filling job in a food processing plant. It is a simple standard. But for that reason, it illustrates the principles behind all labor standards—even the most complex. Many plant managers shy away from standards because they don't understand these simple principles.

Standards have many uses. They can be the basis for comparing work methods, setting up wage plans or making cost estimates, judging work performance, scheduling supervision, coordinating men and machines.

First, a unit of production is selected. For this basket-filling routine, one basket was selected. For other jobs, it might be a hundredweight, can, truck load, or whatever is suitable.

Next, the unit of output is broken down into pieces of work—the elements. Common sense is the main requirement: how far the work is broken down depends on how the standard will be used.

Here is a guide to breaking down a unit of output:

—Select a clear-cut beginning and end for each element. Look for regular, definite end points—such as the fall of a finished case on to a conveyor, or the flash of an inspection light on a belt.

—Break the work into small elements. It is simpler to put small pieces of work together than take large ones apart.

—Separate hand work from machine-paced work. Stacking goods off a conveyor is usually quite different from unloading a dolly.

—Separate constant and variable pieces of work. Putting a lid on a carton, for instance, is constant, though the size may vary.

—Separate regular and irregular pieces of work. Checkweighing might be changed from every 20 baskets to every 30 baskets.

—Classify each element as a constant or variable-time piece of work. Some pieces of work may occur once, others more than once in the same output unit. Separate these—a worksheet will help.

Now look at the standard for the basket-filling operation. The worker gets a basket (.2 min.). He gets 10 lids at a time (.4 min. ÷ 10 = .04 per basket).

Filling the basket is timed for a rate per pound—.01 min. per lb.—because different sized baskets can be used. If a 30 lb. basket is substituted for the 60 lb. basket, a new standard can be quickly calculated.

Every 20th basket is checkweighed. This could be quickly changed for a shift to every 30th or 40th basket (by dividing the time—.4—by the fraction).

Putting on the lid is a constant element—.03 min.

The storage space—now 30 feet away—might be changed. The variable time factor of .03 min./ft. makes it easy to recalculate.

However, note that this simple standard does not allow for personal time, breakdowns, rest times, etc. These allowances must be added, of course. But if you understand the basic principles, you can go on from here to more complex production standards. ●

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Tinnerman Products, Inc., Cleveland, Ohio, produces more than 10,000 different shapes and sizes of "SPEED NUT" brand fasteners for industry . . . many of them to special specifications.

To do this, Tinnerman uses slit steel strands ranging in width from ⅛" to 7½". To carry an inventory of the many strip widths required to meet normal and unusual demands would be almost impossible.

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Here is a fine example of how a small investment in Yoder slitting equipment greatly simplifies and speeds production while effecting important operating economies.

The saving made in time alone, reflects in better customer service through faster completion and delivery of finished products.

If your steel strip or sheet slitting requirements are as low as 100 tons per month or even less, a medium size Yoder slitter can be a very profitable investment for you. The Yoder line includes units of every size and capacity . . . of the most advanced engineering design. Send for the Yoder Slitter Book—a comprehensive text on the mechanics and economics of slitters and slitting line operation, with time studies, cost analyses and other valuable data. Write to:

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In Management

● **A MANAGEMENT REVOLUTION is taking place in many European business communities.** One of the latest—and clearest—signs is the "open door" policy adopted by nine French companies in the Marseille district. They have pledged to share company information with each other—and with outsiders. A second pledge is to convert work simplification into increased productivity, instead of worker "redundancy." And all have agreed to share the benefits of increased productivity equally between the firm itself, the employees, and the customers.

The firms are pooling their training and work study resources; a joint training course—taught by outside consultants—is paid for on a pro rata basis. The companies vary in size from 60 to 600 employees, and they manufacture different products.

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Extremely compact and easily operated in confined spaces this new BLUE BIRD can be used with or without suction as required. Available with 80 C.Cs. Petrol engine operating 4/5 hours on one filling or ½ h.p. Electric motor, all voltages. Suction 65 cu. ft. per minute. Dust bag approx. 2½ cu. ft. A 9ft. extension for wall or shelf cleaning is also available if required.

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● **MASSAGE FOR MANAGEMENT:** Two U.S. manufacturers of chairs and cushions with built-in massaging units report that some of their best customers are executives trying to beat "that old tired feeling."

● **STUDENT SECRETARIES are learning to plot graphs** and perform routine engineering calculations in a new Pittsburgh (U.S.A.) school for engineering secretaries, perhaps the first of its kind in the world. The purpose is to furnish business and industry with "supporting personnel" who will help to increase the output of engineers by relieving them of routine, time-consuming jobs. The students get a two-year course in engineering terminology and laboratory work in chemistry and physics, in addition to standard secretarial training. (*Wall Street Journal, May* 16, *p*1)

● **INDUSTRY WILL FALL DOWN if what is done on the shop is not backed up by sound work in the office,"** warned R. A. Balfour, president of Britain's Association of Chambers of Commerce, in announcing a national apprenticeship program for clerical workers.

● **THE BEST POTENTIAL TOP MANAGERS might well be found deficient** in their work at the middle management level. And, since promotion is based on performance on the job, "it is conceivable that young talent is being wasted each year through erroneous selection."

That is the opinion of two U.S. psychologists after a personality study of 270 executives. The professors say that top management men typically are active and self reliant; they are willing to take risks based on sound ideas.

Middle management men, on the other hand, see themselves as "careful planners who seldom take actions that are not well thought out in advance." They carefully investigate ideas before action is taken; they are stable and dependable. But they are often unwilling to take the risks associated with the top manager's job. (*Petroleum Week, April* 19, *p*56)

▶ YOU AND YOUR PERSONAL AFFAIRS

Photography is probably today's most universal hobby, and the chances are good that you already own a camera. But if you are thinking of buying a new one, or adding to your equipment, here are some of the latest trends and developments:

—Films are getting faster and faster. The new color film Super Anscochrome, for instance, is faster than most black-and-white films of a few years ago. That means more action in color pictures. And the fast black-and-white films—Ilford's HPS, Kodak's Tri-X—have created a whole new school of "natural light" photography.

—Light meters are being built into the camera. And in some of the moderate-priced cameras, the meters are coupled with codes and colors for lens openings and shutter speeds to make picture taking easier.

—Interchangeable lenses are no longer an exclusive feature of high priced cameras. Many medium priced cameras now have them—Liedolf Wetzlar's Lordomat, Voigtlander's Prominent, Kamerawerk King's Regula IIId. The wide-angle lens is the most popular second lens; and the telephoto is useful for candid "local color" shots as well as distant scenes. More high-quality lenses at lower prices are also available.

These are the three most important developments in photography. In other trends, note that levers are replacing knobs on film winding mechanisms; some are single stroke, others double stroke, and it is a matter of personal preference which is best. 35-mm. viewfinders are showing a much bigger and brighter field of view. There's a definite trend toward use of the light value system. It greatly simplifies setting shutter speeds and lens openings.

Note also that the single-lens reflex (35 mm.) is becoming increasingly popular with amateurs. This camera (there are many makes) features through-the-lens focusing, plus the speed and flexibility of the eye-level 35 mm.

Another noteworthy development is the news that Franke & Heidecke, makers of the Rolleiflex line of twin-lens reflex cameras, is putting its "baby" reflex back into production. This camera uses standard 127 roll film; coincidentally, Kodak has brought out 127 color film. Other film manufacturers are sure to follow. Color fans can now have slides that are larger than 35 mm. and will be mounted by the processor.

Camera features and price still go together, but less so than ever before. For about $30, you can get an f:3.5 lens, shutter speed from 1/25 to 1/200 second, focusing from three feet to infinity. Above $50 you will begin to see range finders, double exposure preventers, and shutter speeds from 1 to 1/300 sec. At higher prices ($200 to $400) you get higher speeds (up to 1/1250 sec.), finer lens (f:2.8, f:2, f:1.5), and special features such as delayed action timer and sequence mechanisms. The deluxe market is dominated by Japanese and German cameras, and both display excellent workmanship.

There are also a number of special purpose cameras that you may want to try. Those small precision cameras, the size of a cigarette lighter, will take excellent pictures (up to $140). Then there is the Stereo, which takes small three-dimensional views ($85 to $130), and the Polaroid, which develops its own pictures in one minute ($70 to $250).

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Now vending machines cook hamburgers to order..."perk" and pour coffee with or without cream and sugar. Mallory offers practical, automatic control of cooking, mixing and serving.

TODAY in many factories, schools and public places versatile vending machines are taking on the job of short-order cook as new developments enable the machines to prepare and sell a more varied menu than ever before.

What a choice you get! Hamburgers or hot dogs cooked to order . . . hot soups or ice-cold soft drinks freshly mixed . . . beef stew or chop suey . . . desserts . . . coffee, tea or milk.

These developments may well be speeded by the availability of the Mallory timer switch. Already at work in some machines, it can supervise cooking, mixing and serving—even keep track of sales as you drop your coins in the slot.

This precision-built Mallory switch is a "first cousin" of the Mallory switch that controls the automatic operation of millions of dishwashers, clothes dryers and home laundries.

But Mallory is much more than a switch maker. For years Mallory has been designing and producing precision products in the fields of electronics, electrochemistry and specialized metallurgy—products that are widely used in such growth industries as aviation . . . automotive . . . television and communication . . . nucleonics . . . and many more.

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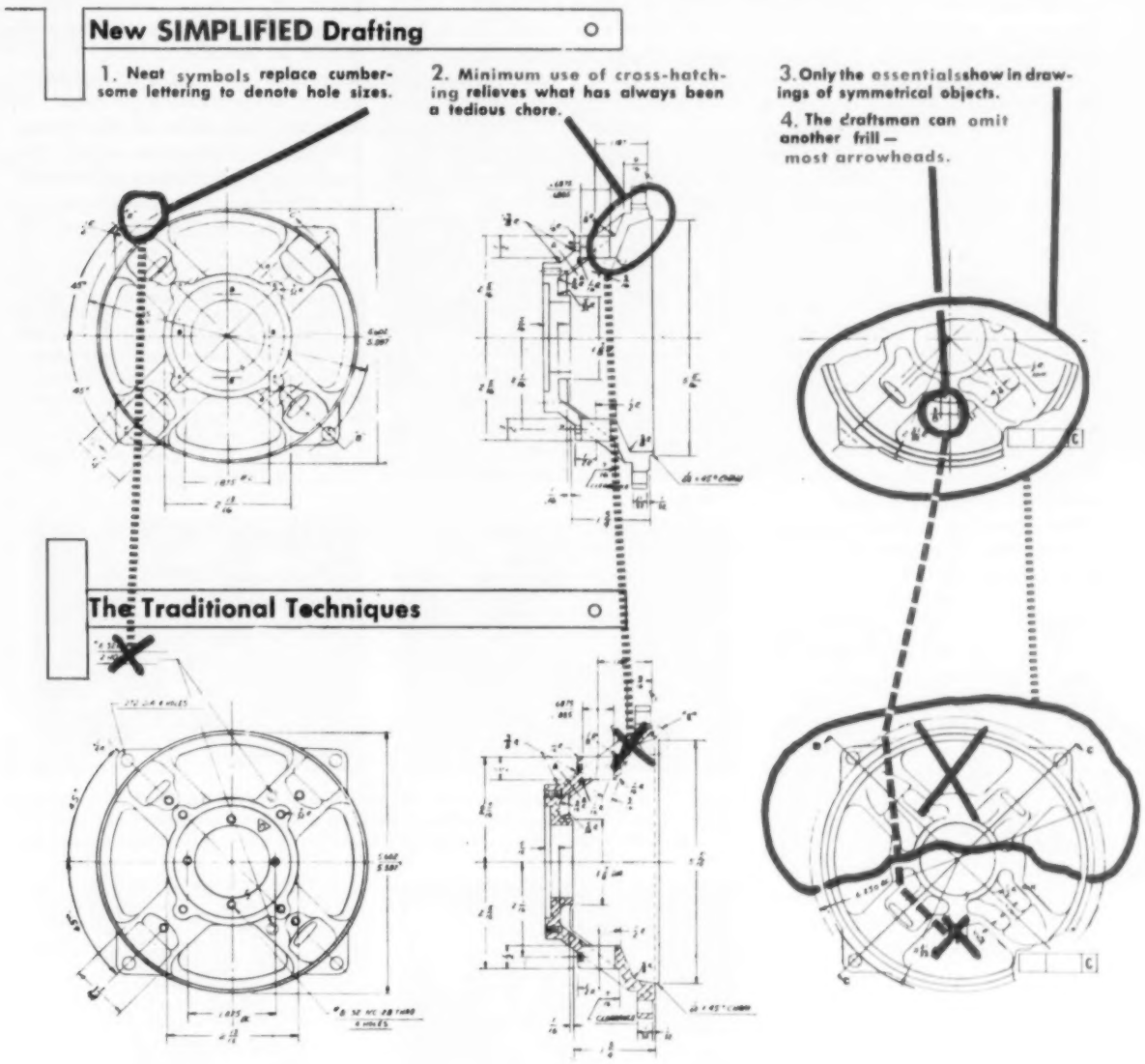
New SIMPLIFIED Drafting
1. Neat symbols replace cumbersome lettering to denote hole sizes.
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3. Only the essentials show in drawings of symmetrical objects.
4. The draftsman can omit another frill — most arrowheads.
The Traditional Techniques

Easing the Engineer's Burden

Digested from BUSINESS WEEK, Apr 20, p173; PRODUCT ENGINEERING

In an era when the shortage of engineers and technicians plagues industry everywhere, there is an urgent need to make the most of the talent already available. And that means saving the time of the engineer. One way to do that is by adapting the techniques of "simplified drafting."

Simplified drafting is a streamlined method of engineering drawing; its advocates claim it saves time, drudgery, and money. Already its influence has spread to about 25% of all drafting done in the U.S.A. Several British companies use the system.

Compared with the traditional drawing, simplified drafting produces almost a skeleton (illustration above). It frees the design engineer from the tedium of filling in repetitive detail.

The British publication *Engineering* says simplified drawing is already accepted in, for example, the use of conventionalized oblique lines for screw threads.

And its editors believe industry would benefit greatly from the use of one-view drawing, freehand sketching, codes and symbols. But they point out that simplified drafting will mean fundamental changes not just modifications, in existing drafting practice.

A classic distinction between the old ways and the new has been cited by General Electric Co.'s

A. H. Rau who favors the system:

—In standard drafting procedure, you must show all three views—top, side, and front—of a cannonball. Inasmuch as a cannonball is a sphere, all three views would be identical, and the effort would seem a little unnecessary.

—In simplified drafting, all you need is one view. Logically, you could get away with a simple written description of the cannonball as an iron sphere.

Simplified drafting is more a difference in approach, as *Engineering* says, than in technique. Its aim is to produce an engineering drawing that is clear, concise, and accurate—in a minimum of time. So it omits frills—such as scale drawings of screw threads, the dotted lines for hidden surfaces, repeated dimensions.

The big savings made possible by simplified drafting come from three directions:

—Reducing the number of views necessary.

Use of special typewriters to type engineering notes.

—Use of appliques pre-printed with engineering notes, standard components of electrical circuits, repeating details, and the like.

This all adds up to a substantial money saving. One of the leading proponents of simplified drafting, American Machine & Foundry Co. (U.S.A.) thinks it could save $750,000 a year in its general engineering laboratory if it took full advantage of the technique.

Despite these advantages there are still problems that must be overcome—including education of draftsmen to the new techniques. An Argentine manufacturer, for instance, says that his two foremen did not like simplified drafting on the grounds of appearance. But when questioned if there was difficulty in interpretation, the draftsmen answered no.

The greatest danger, according to Jasper Gerardi, assistant dean of engineering at the University of Detroit (U.S.A.), is that simplified drafting might prove a setback to years of progress in developing international drafting standards. This process has been going on at three levels:

—Agreement between members of special industries on standards.

—Nationwide agreements under which all industry uses the same standard techniques.

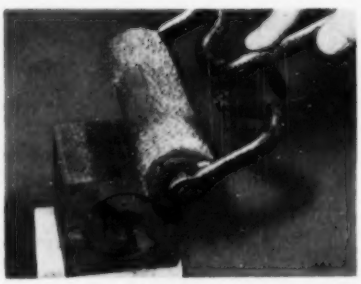
—International accords.

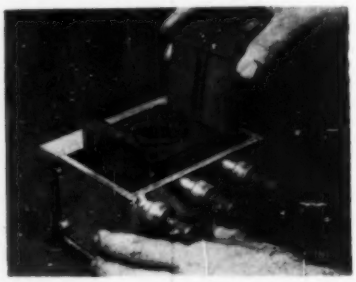
The first two stages have just about been reached, and the U.S.A., Britain, and Canada are well along toward the third. Simplified drafting, Gerardi fears, could retard and confuse the whole program by deviating from accepted practices.

Even though he does concede that it may be profitable if used in one engineering office in one plant, Gerardi says "Simplified drafting cannot be tolerated where communication involves a large number of people in diverse locations. Today's complex technology calls for more information on drawings, not less."

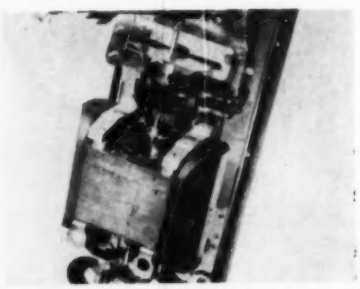
An editorial in the British magazine *Machinist* (now *Metalworking Production*) fortifies Gerardi's argument. It says "Nobody would contest the idea that drawings should be reduced to their essentials. The heart of the argument lies in determination of what is essential." The editorial also raises doubts as to the time saved, the degree of simplification advocated, and "the risk of misinterpretation of the draftsman's intentions." ●

If you want to dig deeper into simplified drafting, read "Simplified Drafting Practices" written by two of the method's most vocal advocates, A. H. Rau and W. L. Healy. You can get the book from John Wiley & Sons, Inc., 440 4th Avenue, New York, New York, U.S.A. ($6.50) or from Chapman & Hall Ltd., 37 Essex St., Strand, London WC 2, England. (48s).





ALNICO MAGNETS are joined to laminated-steel core with single-component epoxy adhesive for a new recording wattmeter. Adhesive is applied as received to parts with roller (left). Magnets are aligned with core in fixture (right).



HAND SCREWS hold magnets and core together (left). Adhesive does not run-off during 50-minute cure at 200°C. Bonded unit is assembled with moving parts on meter frame (right). Advantages are consistent quality, economy.

New Epoxy Simplifies Parts Assembly

Up to now epoxy adhesives for joining metal and non-metal parts have been made of a number of components. Each component has to be carefully weighed and mixed just befors use. This feature has reduced epoxy applications outside the aircraft industry.

Now Rubber & Asbestos Corp. (Bloomfield, New Jersey, U.S.A.) has developed a single-component/epoxy, called M620, that overcomes these limitations. It has these characteristics: (1) no curing agent is needed, (2) low contact pressure, (3) variable curing cycle, (4) long shelf life, (5) good tensile strength. Pictures show one application of the new resin. (*Product Engineering, May, p*164)

Watch the Electron Lights

Digested from ELECTRONICS, May 10, p20

Keep your eye on the fast-developing electronic lighting field.

So far electroluminescence—"EL"—has the most potential for a universal market. EL lights are plates of phosphor embedded in a non-conductor and sandwiched between conductors. Electricity, passed through the conductors, causes the phosphor to glow. The electricity's frequency and type of phosphor determine the light's color; voltage controls brightness.

Westinghouse Electric Co. (U. S. A.) has been working on EL for nine years. It still faces problems, but hopes to be selling by 1959. Efficiency is still too low for general use. Theoretically, EL cells will work 10 times better than incandescent lamps, twice as efficiently as fluorescent. Nothing wears out and the panel-type lighting is shadowless.

The ultimate aim is operation on 60-cycle current, but electronic oscillators could be used for color shifting, architectural drama, display effects, suiting moods of future homeowners, varicolored signal and warning devices. Thus, EL promises a good outlet for transistor and electron-tube oscillator power supplies.

Immediate application of EL may be simple, failproof instrument panel lighting. Sylvania Electric Co. (U.S.A) has been making electroluminescent dial faces for three years.

Electronic aids are establishing themselves in other lighting markets too: electronic flash approach systems (EFAS) for airports, stroboscopic equipment for photography and testing, photoelectric outdoor lighting controls, and dimmers for studio and theater stage lights.

The U.S. Civil Aeronautics Authority may spend $1.3-million by 1960 on 32 EFAS installations. In EFAS, timed electrical surges send a brilliant light flashing along a series of lamps leading to the runway. It helps pilots leaving to get their wheels on the ground.●

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. . . in Finland These wheels of Finnish Emmental cheese weigh 75 to 90 kilograms *each!* In this giant Valio Company factory over 5,000 of them have to be moved from maturing shelves to washers to scales to shipping docks every day The job used to require the hard work of 40 hand laborers. Now 10 men and 10 CLARK fork-lift trucks handle the entire task quickly, quietly, gently, without strain.

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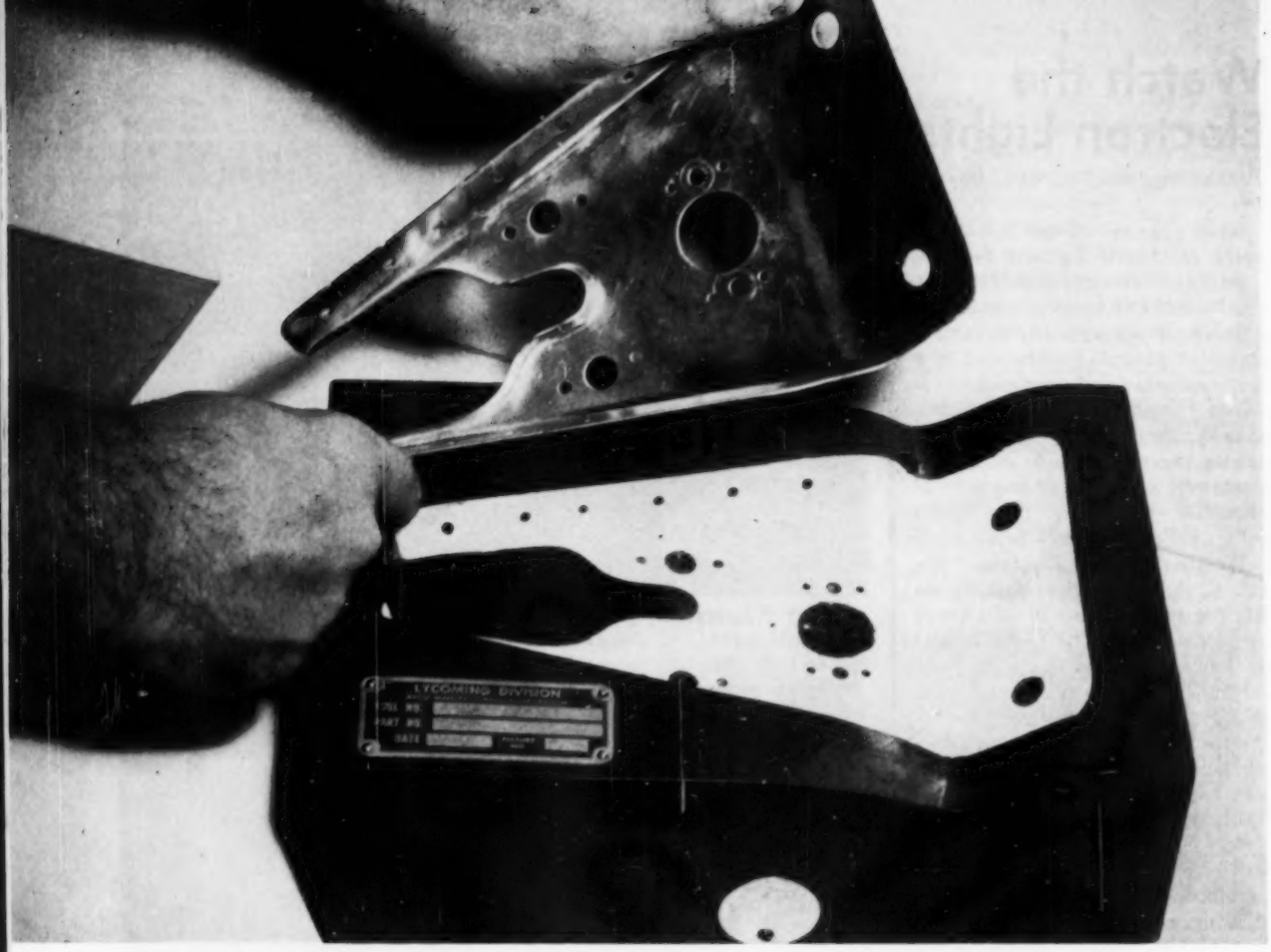


1. PLASTIC CHECKING FIXTURE for deflector costs only $35, does the same job as a steel fixture costing $800 or more. It weighs only 8 kilograms, and is easy to handle. It will not break or crack if dropped or mishandled.

How Plastics Cut Tooling Costs

Digested from FACTORY MANAGEMENT & MAINTENANCE, Apr, p110

One way to cut production costs is to make holding fixtures or parts gages out of plastic-glass laminates. The four pictures here show you what the Lycoming Div., Avco Manufacturing Co. (Stratford, Conn., U.S.A.) is doing. Compared to steel tools, plastic tools:

—Cost considerably less.

—Can be made faster.

—Are lighter and easier to handle and store.

—Resist corrosion.

—Are easier to duplicate, repair or revise.

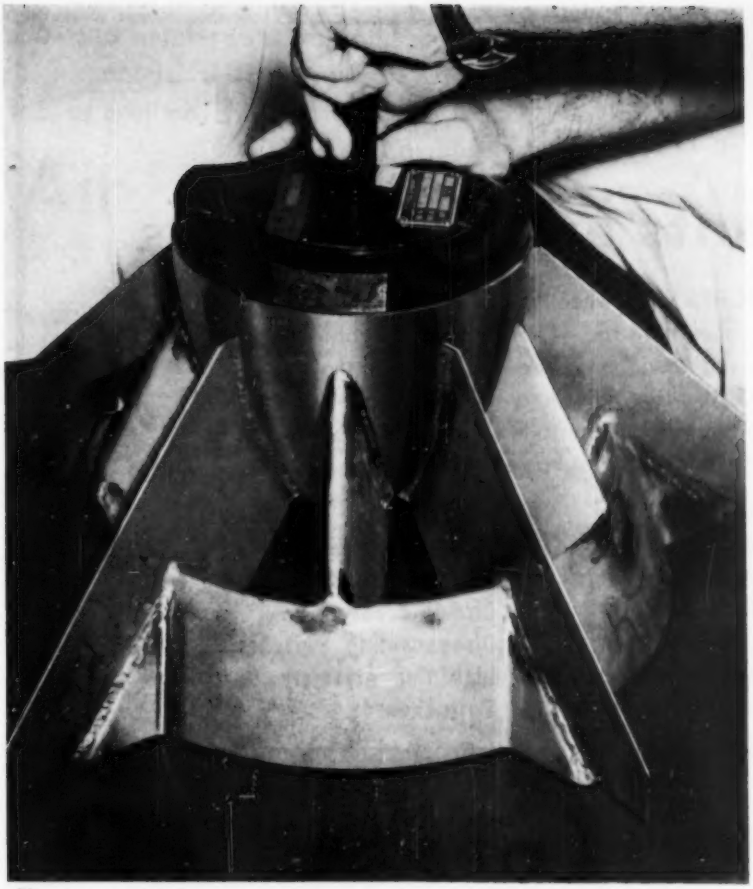
Most of Lycoming's plastic production tools are holding fixtures and dimensional or contour gages. Even though most tools are used to hold or gage 200 parts or less, plastics have proved economical.

No specialized equipment is needed. Lycoming has two methods for making the tools. Either they are cut to the required dimensions from laminated sheet stock, or they are laminated directly on a master part or pattern. In both methods, the company uses alternate layers of epoxy resin and woven glass cloth.

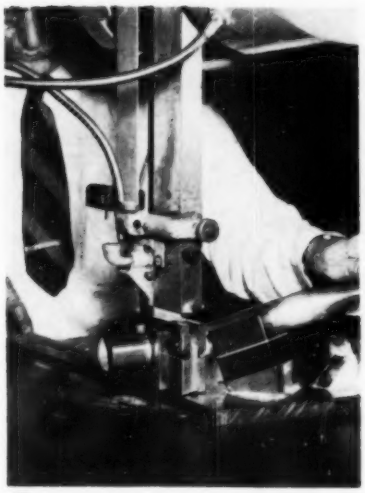
To prepare stock, Lycoming builds 1.2x1.6-meter sheets on a steel surface plate. First the face of the steel plate is waxed. Then a layer of resin is applied. On top of this, the company places a layer of glass cloth. This build-up of resin and glass cloth is repeated until the desired thickness is obtained. In 24 hours time, the sheet cures without outside heat. Flat stock for fixtures or gages is cut directly from this sheet.

Where contours are involved, Lycoming uses the transfer construction method. Here a master part or a pattern molds the gage or fixture. First, the part or pattern is waxed. Then layers of resin and glass cloth are added. When desired thickness is reached, the build-up is left to cure overnight. The result is a perfectly shaped gage with a hollow center that saves weight.

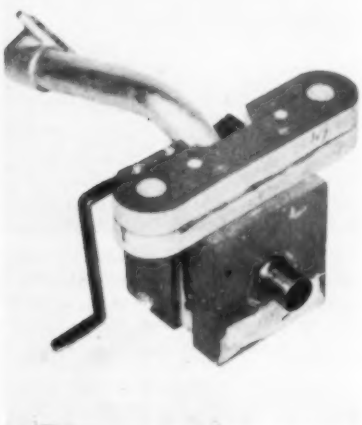
Lycoming has also found that glass-plastics offer a fast, economical way of repairing machinery and equipment. The company replaced a broken feed-screw bracket on toolroom milling machine with plastics. Time for the repair was half a day. Brazing the break would have taken at least two or three days. ●



2. PLUG GAGE tests the inner dimensions of an aircraft engine component. It is easy to handle because of its light plastic construction. And it is easy to modify for use on smaller or larger similar items.



3. HOLDING DIE secures curved tube during swaging operation. Plastic fixture has a horizontal parting line, is molded to exact size and shape of master part. It costs $468. To machine an identical fixture from steel would cost about $2800.



4. CUT-OFF FIXTURE combines steel and epoxy-resin blocks. It tests contour and length of steel tube and holds it in place for a 90° cut. If resin blocks were steel, the cost would be $200 higher. Screws and resin fasten the blocks to steel base.

British Speed Die-Making

Digested from PLASTICS, Mar, p85

Tools and dies of intricate shape can be cast in any metal from simple patterns or prototype parts by a New British technique. The "Truprocess," developed in England by Darwins Ltd., Sheffield, will produce tooling elements and short-run production parts with as much accuracy as lost-wax casting, but without expensive tooling. One of the important advantages is that large bulky parts with varying wall thicknesses can be cast—up to 500 kilograms at present.

Key to the method is a casting slurry made by mixing a jelling agent (ethyl silicate) with sillimanite and then adding a powdered refractory. After the mixture is blended, it is poured over a pattern, where it solidifies within several minutes into a rubber-like condition. In this form, the mold can be easily stripped off. The mold returns accurately to cast dimensions after flexing.

Then the mold is fired in a gas flame to burn out the jelling agent's reaction products (mostly alcohol) and drive off volatile products. The result is a solid, hard ceramic mold with minute crazing throughout. This crazing, or cracking, helps produce sound castings by allowing gases to escape when metal is poured. The final mold is immune to spalling and thermal shock, and is ready for pouring within one or two hours after the mixing started.

Compared to lost-wax casting, the process is much faster for short runs, and does not require tooling for making wax patterns. It is more accurate than shell molding. And the fine finish of Truprocess permits casting hard metals such as stellite and high-cobalt steels. Only polishing and final grinding are required after heat treatment.

Production parts can also be made, but the process is expensive for long runs. Such parts as turbine blades, jet-engine and aircraft fuel-system structural elements have been cast. Principle application of Truprocess will be in making dies for plastic molding and punches for metal-shaping. ●

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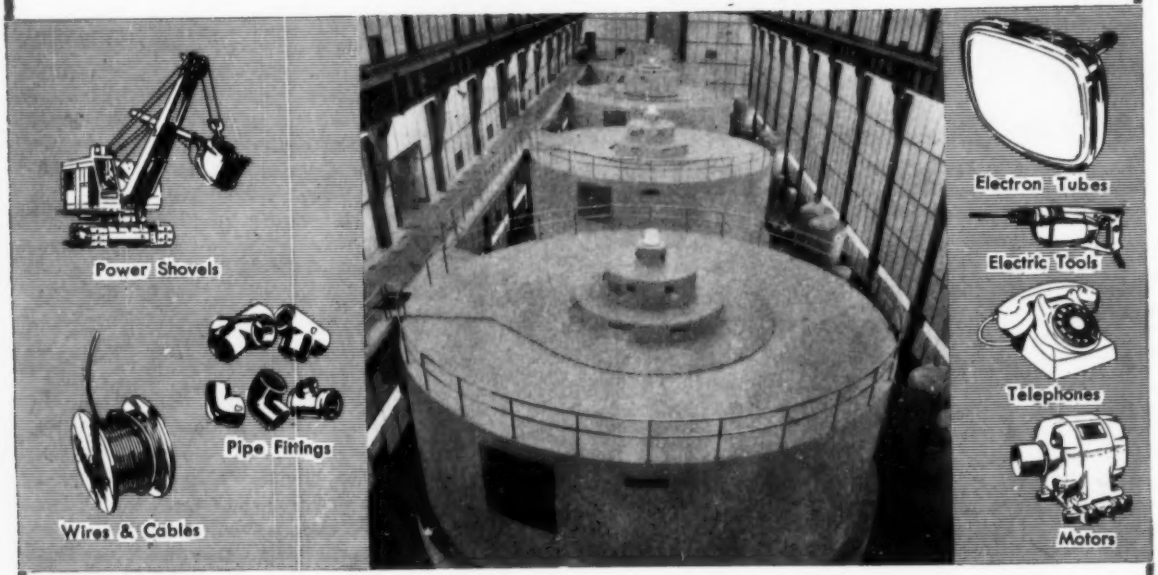

Pictures show the most powerful group of generators in Japan, installed at the Sakuma Power Plant. Each unit driven by a 100,000 kW Francis Turbine yields 93,000 kVA of electric energy. The two units in the foreground, complete with turbines, have been supplied by Hitachi, Ltd.

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Control through compressed-air sevices can be cheaper and simpler to install and maintain than other control methods. With it you can mechanize many machine operations, even build an automatic system.

Air: One Road to Automation

Digested from BUSINESS, May, p85

In the search for better ways to mechanize machine operations many companies are looking at pneumatic controls. These devices permit mechanization that borders on full automation. Pneumatic control systems can often perform the same functions as electronic devices that are usually associated with automation. And the air cylinders and valves—the main "tools" of pneumatic control—are generally cheaper than electronic instruments.

With pneumatic controls, you can build an entirely automatic system, with either the machine itself being "programmed" to control the work sequence, or the sequence being controlled by the state of the workpiece as the job proceeds. Non-automatic machinery can be modified and converted to a relatively advanced system of "automation."

Pneumatic cylinders can push, pull, lift, clamp; move quickly or slowly; can be controlled remotely; and can be applied exactly where power is required. Wear and tear is negligible; maintenance is simple.

Two of the most important developments that have helped open automation to pneumatics are:

—**Hydro-pneumatic cylinder.** An air cylinder by itself cannot move a tool or workpiece against a variable load at a constant speed. But when you place an oil-hydraulic cylinder, or "dashpot," between the air cylinder and tool, the tool's progress becomes controlled and steady.

—**Solenoid valves.** These permit remote control. Electricity carries a "message" from anywhere in the plant to the solenoid valve which in turn actuates an air cylinder.

A variety of cylinders are available, and most requirements can be met by standard units. The number of jobs to which pneumatics can be applied is enormous. These case studies from Britain show some of the tasks to which pneumatic control has been successfully applied:

1. At the Edmonton plant of British Oxygen Engineering Ltd., **two pneumatically controlled and powered special-purpose machines help produce compressed-gas regulator bodies.** These are brass castings, and the object is to drill and face four peripheral holes and one cross hole in them.

Basically, the special-purpose machine consists of a series of unit heads positioned radially around the component which is held centrally on the machine by an air chuck. Each head performs work on one of the five bores, and all heads work simultaneously. A push-button control starts the machine's cycle. An interlock system prevents the machine from becoming operative before a component is held in the chuck. The cycle is then automatic.

Large savings have been made over the old method, which involved two operations on a turret lathe and one on a radial drill. Total number of manhours needed to produce 1,000 components has been reduced from 213 to 56.

2. Lec Refrigeration Ltd., has **a pneumatic flanging machine for forming refrigerator doors.** The unflanged door is placed manually in the machine. A button is depressed, and a cylinder moves the corner formers into position; and at the end of their stroke, a pilot valve signals five other cylinders to bring two clamps into position to grip the panel. At the end of their strokes, these cylinders in turn signal a further bank of five cylinders that fold the edge of the panel under and back. These retract and signal the final cylinders to move in, folding the corners of the flanges under.

These return automatically and on reaching the "normal" position cause the clamping cylinders to retract. The machine is then ready for the door to be removed and turned around, so that the remaining edge and side can be formed.

3. Mullard Ltd. uses **a pneumatically controlled and powered multi-head drilling machine for drilling holes in the flanges of valve covers.**

The operator manually loads the components into a cavity jig. A pedal is depressed, and from then on, the cycle is automatic. The drill spindle advances and the component is clamped. The five holes are drilled simultaneously, then the spindle retracts. During its retraction stroke, an air blast cleans out chips, and on completion of the retraction stroke, a cylinder beneath the cavity jig pushes up the component, and an air blast blows it into a receptacle.

4. Railston Supplies Ltd. uses **an air-controlled automatic soldering machine for soldering two handle lugs simultaneously on to paint cans.** Four support blocks hold the can and two heating pads are located diametrically on the can. Cylinders clamp the lugs between the can and the heating pads. The pads heat the lugs. Solder wire is fed automatically by an air cylinder to the lugs. Pressure is maintained on the lugs after the current has been switched off, ensuring that sound joints are made. During the operation, cooling blasts of air ensure that the printed can is not defaced, and so accurate is the heat control that no reserve area needs to be left free of printed matter. At the completion of the cycle, the can is automatically unclamped. ●

Looking Ahead in Technology

● **WOOL can be made mothproof by an inexpensive process** reported by Australian scientists. Process is called SI-RO-MOTH and uses the insecticide Dieldrin. Treated wool has no odor and all properties of the treated fabric remain unchanged. Protection will last the life of the garment and is unaffected by washing or dry-cleaning. (*American Letter, Apr 27*).

● **"RADIO PILL" that sends out frequency modulated signals to medical researchers** as it passes through the human body has been developed jointly by the Rockefeller Institute, New York Veterans Administration Hospital, and Radio Corp. of America. Designed for research in intestinal tract, the "pill" is a plastic capsule small enough to swallow.

● **CHEMICALS that prevent light degradation of dyes, paints, and plastics have been developed** by General Aniline & Film Corp. and American Cyanamid Co. of the U.S.A. Called "substitute benzophenones," they absorb ultra-violet rays and are stable to both heat and light when mixed with the product. They are not yet practical for fabric; and their cost is high. (*Chemical Week, May 4, p40*).

● **RUSSIANS claim to have invented a way to make sponge iron.** Scientists at the Oil Institute of the U. S. S. R. Academy of Science report they can make sponge iron by reducing iron oxide with methane. The methane is converted into carbon dioxide and hydrogen, which can then be recovered.

The reaction is carried out in a tall cylinder. Finely pulverized iron ore is swept through an up-draft of gas. The Russians plan to build a plant which they claim will cut comparable blast furnace costs in half. (*Chemical Week, Apr* 27, *p*81)

● **A DOZEN TYPES of paper, including newsprint, can be made from bamboo,** according to the Herty Foundation Laboratory (Savannah, Georgia, U.S.A.). By "cooking" bamboo (chemically reducing it to pulp), the laboratory has produced tissue paper, thin paper suitable for printing, wrapping paper, and butcher's paper. Chief advantage of bamboo seems to be low cost.

● **NEW PLASTICS will conduct electricity,** reports Nippon Telephone & Telegraph Public Corp. (Tokyo). The process adds pulverized silver and copper to plastic. Almost any plastic can be used—stiff, soft or even in paint form—and it can be directly electroplated. The Japanese firm says the plastic has the same electrical resistance as mercury at room temperature. (*McGraw-Hill World News*)

● **TINY CRYSTALS of iron are teaming with copper, nylon, steel, and other materials to make strong bearings, long-wearing automobile springs, better electrical conductors and other products.** The crystals are a new type of iron called alpha iron. They are so small that a thousand million of them occupy considerably less space than a grain of table salt.

The crystals behave not as metals or fillers but as chemicals, according to the M. W. Freeman Co. (U.S.A.). When used with copper, the copper develops superior electrical conductivity; in steel, the product has superior wearing characteristics; in magnetic iron, better magnetic properties are achieved.

● **ALUMINUM was used in 0.09-centimeter industrial sheet form to cover the entire shell** of El Palmar sugar refinery in Venezuela, according to Northern Aluminium Co., Ltd. (England). El Palmar was just completed and is the largest sugar refinery in South America. **Aluminum is being used by General Motors Corp.,** Buick Division, to make brake drums. Aluminum was chosen for its rapid heat-dissipating characteristics. (*E&MJ Metal & Mineral Markets, Apr* 18)

● **THE DUTCH will try out electrolytic membranes as a way to provide fresh water from the sea.** A membrane device will be built in Scheveningen harbor by T.N.A.O., the Dutch organization for applied scientific research. The test period will last about one year.

● **FASTER GROWING PLANTS—up to three times more rapid than normal—can be raised with the help of gibberellic acids,** now available for the first time in quantity from Abbott Laboratories (U.S.A.). The acids not only stimulate plant growth, they also cause earlier flowering, faster germination, more rapid seed maturation, and release from dormancy.

● **A STEEL "SANDWICH" plate developed in Germany** by Calottan-Technik (Frankfurt) consists of three thin steel sheets, with the middle sheet punched according to a pattern of cup-shaped elevations and projections. This middle sheet is spot-welded at some places to the upper sheet and at other places to the lower sheet. The sandwich has 10 times the buckling resistance of a similar weight flat-sheet structure. (*Product Engineering, Apr, p*199)

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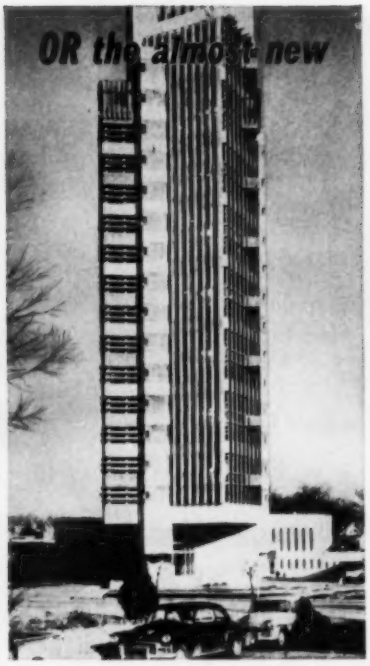

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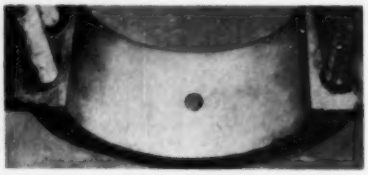
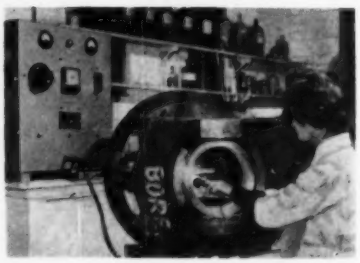


AFTER: 0.0125 mm. plated nickel and tin coating makes bearing as good as new.



EQUIPMENT: Special rectifier, two leads, one with stylus, and plating solution.

Plates Metal where Needed

Digested from POWER, May, p118

Maintenance men often stumble over the problem of replacing lost metal caused by wear, erosion, arcing, fretting corrosion, or faulty machining. Sometimes the part is thrown away, or sometimes it is salvaged by welding or electroplating new metal. Either way takes time and money. But now you can build up the exact amount of metal needed by plating—on the exact area—and do it with a portable unit that needs no expensive plating tanks.

Circuit breakers, for example, normally wear only on contact surfaces where arcing causes the surfaces to pit, blacken, and burn. Sooner or later you must rebuild these areas. Plating them with rhodium will do the job. But rhodium is more expensive than platinum. Conventional plating techniques will deposit most of the

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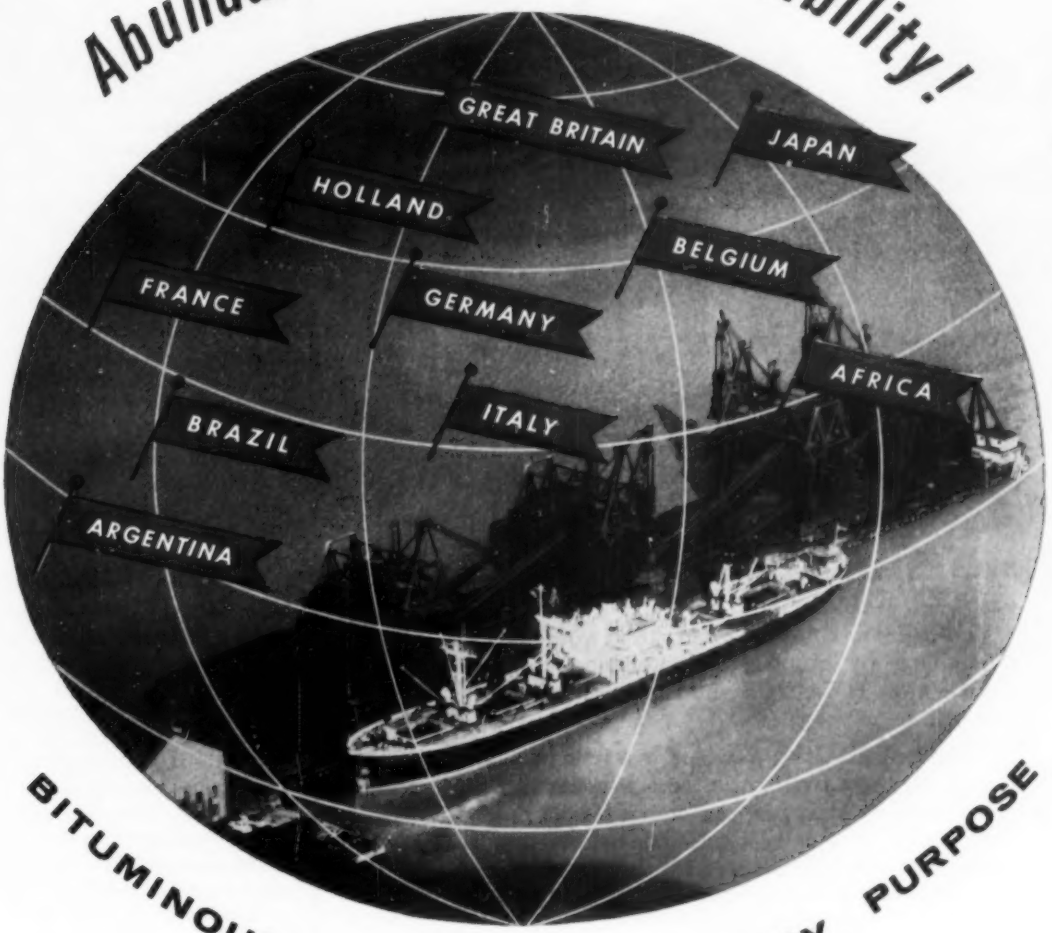

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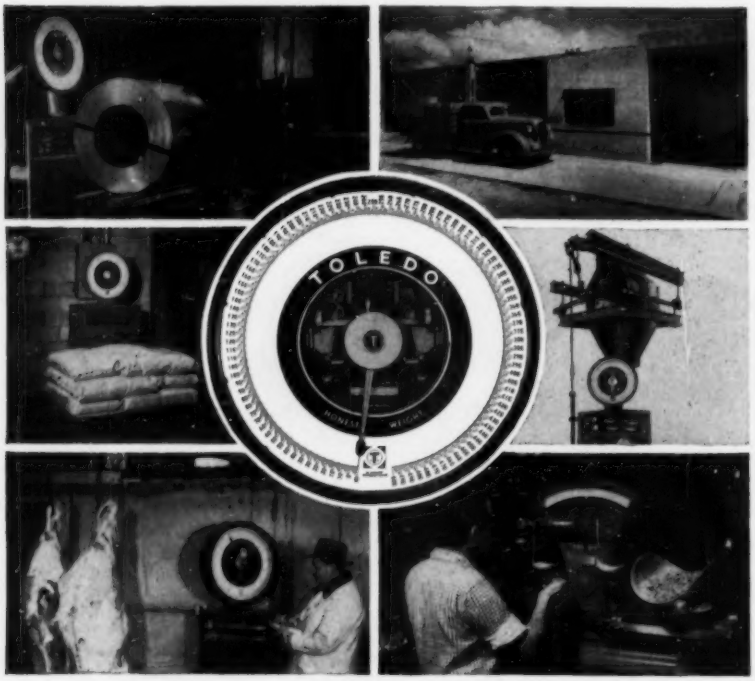

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metal over the breaker arm where it is not needed. Selective plating provides the answer using equipment made by Dalic Metachemical Ltd. (Toronto, Ont., Canada).

The Dalic process will also cut down fretting corrosion problems with roller-contact bearings. It helps obtain a tight precision fit between bearing rings and housing or shaft. A thin layer of soft metal is deposited on the outer surface of the bearing rings. The metal completely fills the space between the bearing and the stationary machine member during assembly, by either the press-fit or shrink-fit methods. Four metals have been found best—tin, cadmium, copper, and silver.

The process uses a special rectifier to change alternating line current to direct current. Voltage is adjustable. Two leads come out of the rectifier: the cathode which is clamped to the workpiece, and the anode which ends in a plating stylus. Either a plug-type or cap-type stylus is used, depending on the size and shape of the area to be plated.

The stylus is covered with cotton saturated with the plating solution. The plating solutions are basic, rather than acidic as most electrolytes. Solutions are available for plating almost any metal.

The process is fast because you only have to plate the section that actually needs protection, not the entire part. You can deposit one metal, then another one.

Thickness of deposit is controllable within 0.0025 millimeters with a ampere-hour meter. The area is plated until previously calculated ampere-hours have been achieved. High current densities are used. This gives better adhesion to base metal and denser deposits that result in repairs that will last longer.

Selective plating is handy when an exact deposit of almost any metal is needed in a given area, or when the part to be repaired can not be easily removed for immersion plating.

Another big advantage is that no overplating and machining is needed to obtain exact dimension. Cost of equipment needed for selective plating is reasonable. Any skilled maintenance man can get good results after a short time.●

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Marketing Problems?—"Readings In Marketing" is a selection of writings (by some of America's most respected marketing men) covering such subjects as the marketing job, customers and their motivations, merchandising, market structure, sales programs, pricing and general management control. Price: $6.50. (McGraw-Hill Book Co., Inc., 330 W. 42nd Street, New York 36, New York). . . . "The Sales Supervisor and His Place in Management" is a guide to the development of the first-line sales supervisor. Price: $3.75. (American Management Association, 1515 Broadway, New York 36, New York.

Bulletins From Industry—Better Lighting: "Incandescent Lighting Guide Book" is a reference source on the incandescent light—how it operates and how it can best be used. "Fluorescent Lighting Guide Book" cites the advantages of fluorescent lighting for industrial and commercial use. (Sylvania Electric Products Inc., Lighting Advertising Dept., 1740 Broadway, New York 19, New York). . . . Engineering manual E-56 describes Oilite powder metallurgy products—self lubricating bearings, finished machine parts, and permanent metal filters. (Amplex Division, Chrysler Corporation, Detroit 31, Michigan). . . . The Flood Co. will tell you all about "Penetrol", a clear, air-drying, oil coating that protects both metal and wood. (The Flood Co., Hudson, Ohio). . . . An illustrated booklet describes some of the main uses of synthetic resins and plastics in construction. (Information Dept., Distillers Plastics Group, Devonshire House, Piccadilly, London W. 1, England. . . . A brochure describes the new SADI electro-mechanical safety coupling. Copies of SADI's technical information journal, "Motorization", are also available. (Soc. Auxiliaire d'Industrie SADI, 4, rue des Carburants, Forest-Bruxelles, Belgium.

The Common Market—The Federation of British Industries has published a booklet containing a wealth of information on the projected European Free Trade Area—to help industrialists assess the implications of the scheme for their business. Price: 6s. or 84¢. (Federation of British Industries, 21 Tothill Street, Westminster, London SW1, England.)

Time Study—"Motion Economy and Work Measurement" describes the application of motion economy to office work, micromotion study and the equipment used, and organization for methods improvement. Price: $7.50. (The Ronald Press Co., 15 E. 26th Street, New York 10, New York.)

Designs for People—This single-volume reference on "human engineering" covers the design of equipment and work space with the worker or user in mind: vision, body measurement, body sensitivity, movement and control, and orientation. Price: $3.50. (University of California Press, Berkeley 4, California.)

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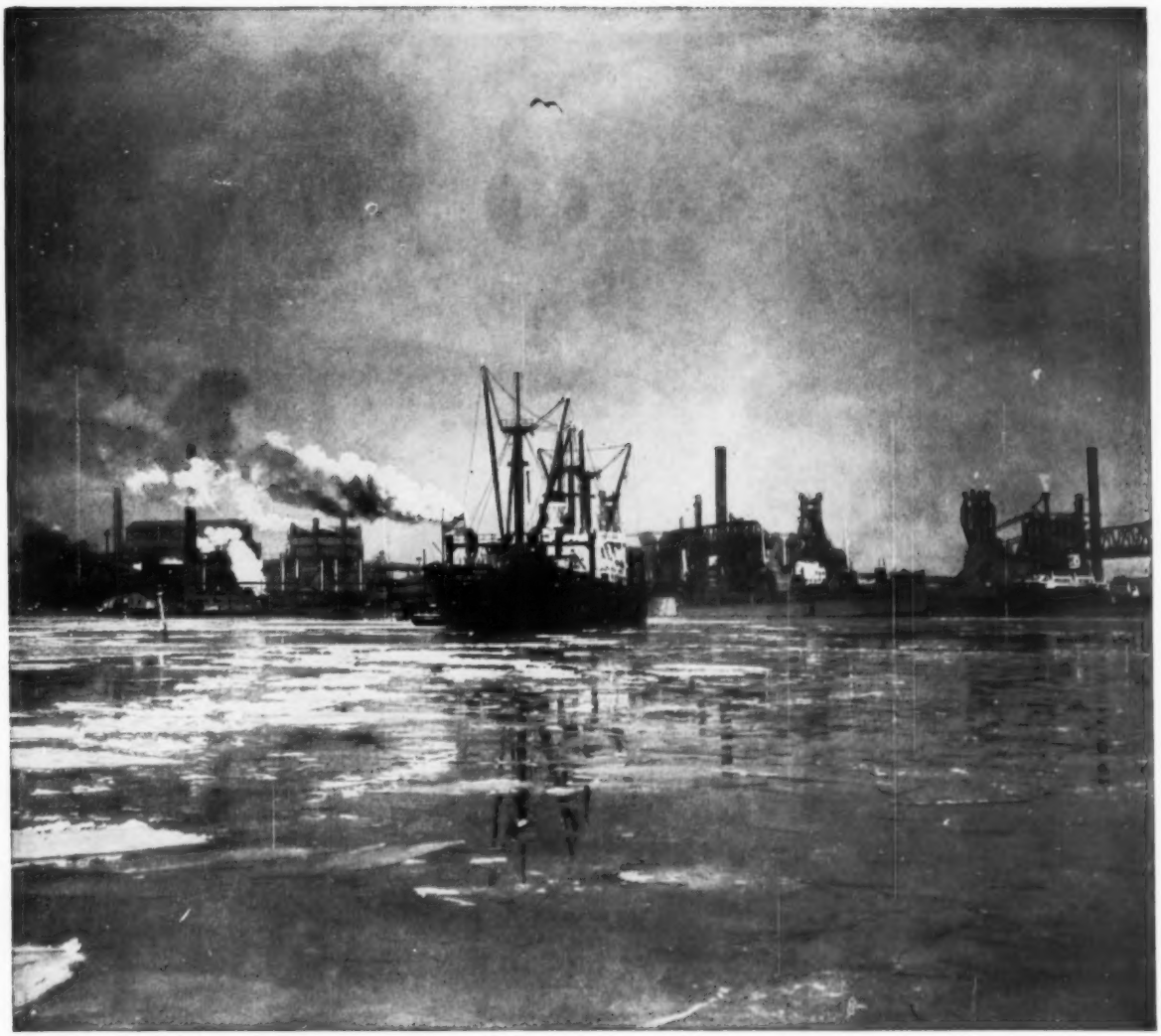

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